

AD 715 789

OBSERVATIONS OF CARBON DIOXIDE  
AND PLANT GROWTH  
IN AN ARCTIC ECOSYSTEM

FINAL REPORT

by

John J. Kelley\*  
Department of Atmospheric Sciences  
University of Washington

and

Philip L. Johnson  
Institute of Ecology  
University of Georgia

A Joint Program Conducted by

Department of Atmospheric Sciences, University of Washington  
Seattle, Washington

and

U. S. Army Cold Regions Research and Engineering Laboratory  
Hanover, New Hampshire

REPRODUCTION IN WHOLE OR IN PART  
IS PERMITTED FOR ANY PURPOSE  
OF THE UNITED STATES GOVERNMENT

\*Present affiliation: Institute of Marine Science, University of Alaska

## ABSTRACT

This report presents the results of analyses of atmospheric carbon dioxide and ecological factors at Meade River Camp and at North Meadow Lake (Barrow), Alaska. The data summarize reference gas calibrations used in the CO<sub>2</sub> program, with a discussion of methods used to obtain the data for CO<sub>2</sub> concentrations in air at both stations. Variations of CO<sub>2</sub> in the air, at the ground level, and at 16 m above the ground are given for both the Meade River Station and North Meadow Lake. Meteorological observations are presented for the period of observations. The percent rate of growth of five species of tundra plants is shown, and the correlation between CO<sub>2</sub> concentration in the atmosphere and the percent of maximum growth is given. The data for the amounts of chlorophyll and dry weight production in each of four types of communities are presented. A list of publications resulting from the interpretation of these data is included.

## TABLE OF CONTENTS

	Page
List of Figures	i
List of Tables	iv
I. Introduction	1
II. Carbon Dioxide Observations	4
III. Ecological Observations	82
Acknowledgements	119
Bibliography	120

# LIST OF FIGURES

	Page
Figure 1. Location of North Meadow Lake Station (71°18'N, 159°39'W).	2
Figure 2. Location of NARL Camp on the Meade River 65 miles SSW of Barrow (70°28'N, 157°26'W).	3
Figure 3. Daily average CO <sub>2</sub> concentration (ppm) at 16m, North Meadow Lake, 1966.	29
Figure 4. Daily average CO <sub>2</sub> concentration (ppm) at 16m, Meade River, 1966.	30
Figure 5. Weekly average CO <sub>2</sub> concentration (ppm) at 16m, North Meadow Lake, 1966.	32
Figure 6. Weekly average CO <sub>2</sub> concentration (ppm) at 16m, Meade River, 1966.	33
Figure 7. Daily average CO <sub>2</sub> concentration (ppm) at ground level, North Meadow Lake, 1966.	43
Figure 8. Daily average CO <sub>2</sub> concentration (ppm) at ground level, Meade River, Alaska, 1966.	44
Figure 9. Weekly average concentration (ppm) at ground level, North Meadow Lake, 1966.	46
Figure 10. Weekly average concentration (ppm) at ground level, Meade River, 1966.	47
Figure 11. Three day running mean of CO <sub>2</sub> concentration at 16m, North Meadow Lake, 1966.	55
Figure 12. Three day running mean of CO <sub>2</sub> concentrations at 16m, Meade River, 1966.	56
Figure 13. Six day running mean CO <sub>2</sub> concentration at 16m, North Meadow Lake, 1966.	63
Figure 14. Six day running mean CO <sub>2</sub> concentration at 16m, Meade River, 1966.	64
Figure 15. Diurnal variation of CO <sub>2</sub> at 16m, Meade River, 1966.	67
Figure 16. Diurnal variation of CO <sub>2</sub> at 16m, North Meadow Lake, 1966.	70
Figure 17. Three month diurnal variation of CO <sub>2</sub> , June, July, August, at 16m, North Meadow Lake, 1966.	73

	Page
Figure 18. Three month diurnal variation of CO <sub>2</sub> , June, July, August, at 16m, Meade River, 1966.	74
Figure 19. Average daily CO <sub>2</sub> gradient between 16m and 1cm at Meade River and North Meadow Lake.	81
Figure 20. Meade River Study Site showing positions of camp buildings, coal mine, carbon dioxide tower, transects for weekly monitoring of thaw depth, and plant growth.	83
Figure 21. Topographic profiles of three transects at Meade River Camp.	84
Figure 22-26. Hourly carbon dioxide concentration and air temperature at Meade River on selected days at 16m and 1cm.	85 - 89
Figure 27. Precipitation distribution during the 1966 thaw season at Meade River.	91
Figure 28. Total short wave and net solar radiation during the 1966 thaw season at Meade River.	92
Figure 29. Daily average concentration of carbon dioxide (ppm) at 16m above tundra at Meade River Camp and North Meadow Lake (Barrow) during the 1966 thaw season.	93
Figure 30. Intensity and mean hourly distribution of net radiation at Meade River Camp in June, August, and for three summer months.	94
Figure 31. Progression of daily mean, maximum and minimum temperatures based on five six's-type mercury thermometers at 5cm height in a screen.	98
Figure 32. Comparison of mean daily temperatures based on hourly thermograph values at 5cm height at Barrow and Meade River.	99
Figure 33. Progression of thaw in 1966 as an average 190 points on Transect A, 140 points on Transect B, and at 17 plant growth stations.	100
Figure 34. Dry matter production in an arctic tundra ecosystem at Meade River, 1966.	102
Figure 35-40. Growth rates of six species at Meade River.	107 - 112

	Page
Figure 41. Regression of six-day mean carbon dioxide concentration at 16m on percentage of maximum plant growth at Meade River.	113
Figure 42. Histograms of chlorophyll distribution in four components of four plant communities.	114

# LIST OF TABLES

		Page
Table 1	Recorder scale factors: mutual comparison method, Meade River, Alaska	12-13
Table 2	Summary of recorder scale factors: single set analysis, Meade River, Alaska	14-15
Table 3	Summary of recorder scale factors: mutual comparison method, Meade River, Alaska	16
Table 4	Index values of reference gases, Meade River, Alaska	17
Table 5	Index differences of reference gases used to determine recorder scale factors, Meade River, Alaska	18
Table 6	Summary of recorder scale factors: sliding recorder scale factors, Meade River, Alaska	19-20
Table 7	Smoothed recorder scale factors for Barrow CO <sub>2</sub> analyzer, Barrow, Alaska	21-22
Table 8	Daily average index of carbon dioxide (ppm) manometric concentration scale (summary), Meade River and North Meadow Lake, Alaska	23-28
Table 9	Weekly average index of carbon dioxide (ppm) manometric concentration scale, Meade River and North Meadow Lake, Alaska	31
Table 10	Monthly average index of carbon dioxide (ppm) manometric concentration scale, Meade River and North Meadow Lake, Alaska	34
Table 11	Concentration of carbon dioxide with wind direction, Meade River and North Meadow Lake, Alaska	35-36
Table 12	Daily average index of carbon dioxide (ppm) manometric concentration scale, Meade River and North Meadow Lake, Alaska	37-42
Table 13	Weekly average index of carbon dioxide (ppm) manometric concentration scale, Meade River and North Meadow Lake, Alaska	45
Table 14	Monthly average index of carbon dioxide (ppm) manometric concentration scale, Meade River and North Meadow Lake, Alaska	48

		Page
Table 15	Three day running mean concentration of atmospheric carbon dioxide (ppm), Meade River and North Meadow Lake, Alaska	49-54
Table 16	Six day running mean concentration of atmospheric carbon dioxide (ppm), Meade River and North Meadow Lake, Alaska	57-62
Table 17	Diurnal course of carbon dioxide, Meade River, Alaska	65-66
Table 18	Diurnal course of carbon dioxide, North Meadow Lake, Alaska	68-69
Table 19	Three month average diurnal course of carbon dioxide, June, July and August, 1966, Meade River and North Meadow Lake, Alaska	71-72
Table 20	Carbon dioxide differences between the ground and the 16m level	75-80
Table 21	Precipitation at Meade River Camp during the growing season, 21 May to 10 September, 1966	90
Table 22	Open pan evaporation rates, $\text{mg}/\text{cm}^2$	95-96
Table 23	Average daily wind velocities during the thaw season at Meade River Camp, 1966	97
Table 24	Survey chemistry of Meade River water, 1966	101
Table 25	Harvested biomass at Meade River, 1966	103
Table 26	Standing crop of eight photosynthesis sites	104
Table 27	Growth increment of six species at Meade River in 1966	105
Table 28	Weekly plant growth at Meade River, Alaska	106
Table 29	Amount of chlorophyll per unit land area ( $\text{g}/\text{m}^2$ ) and its distribution in four arctic tundra communities	115
Table 30	Amount of chlorophyll per unit dry tissue ( $\text{mg}/\text{g}$ ) in four arctic tundra communities	115
Table 31	Chlorophyll a:b ratio and carotenoid ratio in four arctic tundra communities	116



		Page
Table 32	Current amount of chlorophyll and dry weight production in each sample of each community	117
Table 33	Weight loss from litter bags exposed at Barrow 24 August 1965 to 12 September 1966	118

## I. INTRODUCTION

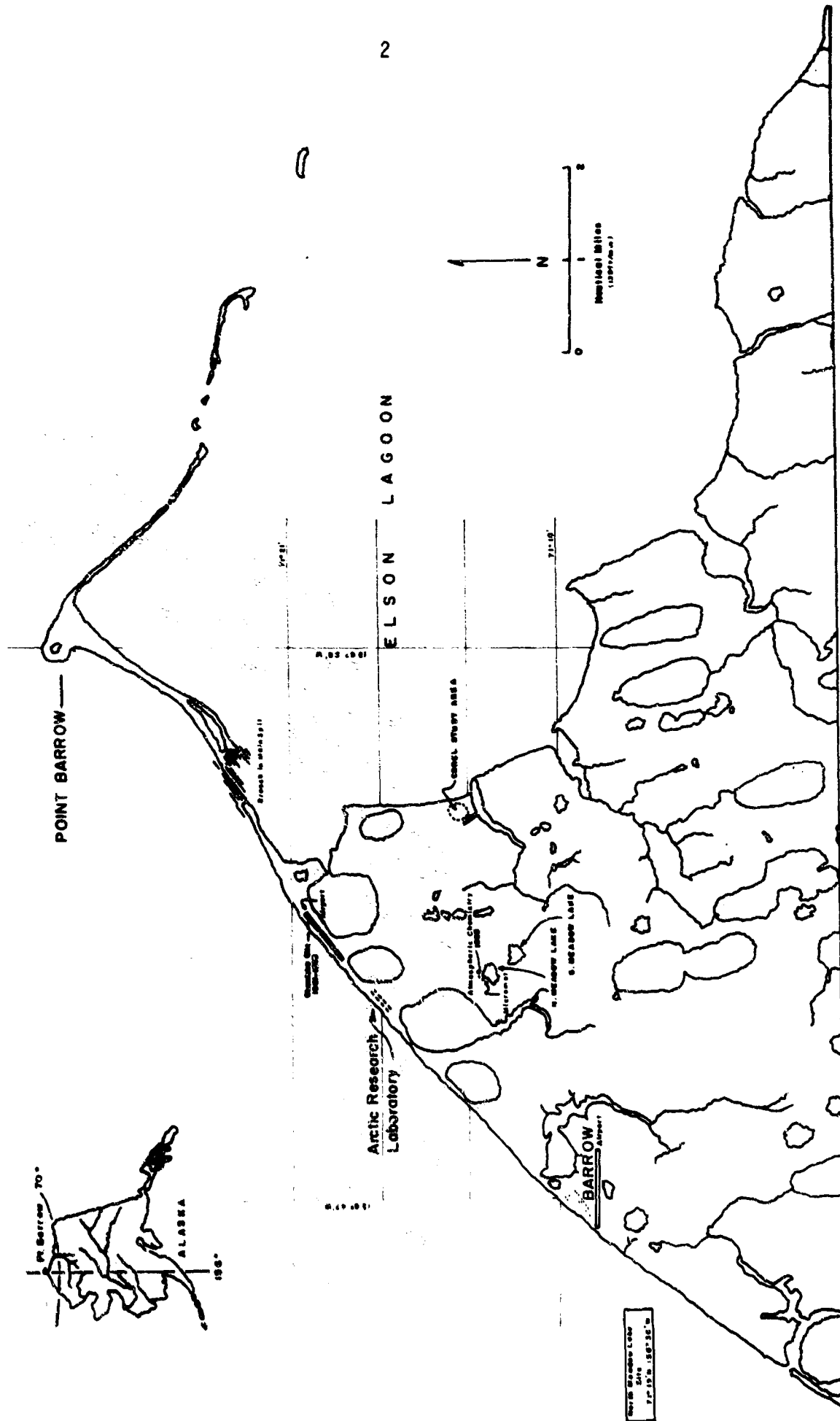
This report is a record of the data for measurements of carbon dioxide in the atmosphere near the ground and ecological observations during the summer of 1966 at two field stations separated by approximately  $1^{\circ}$  of latitude. Observations were made throughout the growing season on the Arctic coastal plain of Alaska. The North Meadow Lake Station at an elevation of 6 m ( $71^{\circ}18'N$ ,  $159^{\circ}39'W$ ) was 2 km south of the Arctic Ocean and the Navy Arctic Research Laboratory, Barrow, Alaska (Figure 18a). Atmospheric carbon dioxide has been monitored at this station from 1961 to 1967.

The Meade River Station at an elevation of 15 m ( $70^{\circ}28'N$ ,  $157^{\circ}26'W$ ) is 110 km SSW of Barrow and was operated from 24 May to 9 September, 1966 (Figures 1 and 2). The terrain is of low relief between the two stations and contains numerous lakes and graminoid tundra vegetation of low stature. No permanent settlements or sources of atmospheric pollution occur between the two stations.

The data in this report are presented in two sections. The first section describes the carbon dioxide data observed at North Meadow Lake and at Meade River. The second section presents environmental and ecological data which documents the results of meteorological observations and measurements which support the progression of plant growth during the period of seasonal thaw. These results therefore extend from the beginning of snow melt in late May thru the growing season of approximately 80 days to the period of freezeup in early September.

Interpretations of these data have been published as reports and journal contributions and the references cited in the Bibliography should be consulted for an expansion of methodology, data synthesis and significance.

# ARCTIC OCEAN



COORDINATES REPRESENT THE APPARENT FIX OF:  
 1) BARROW AND PUBLISHED POSITION  
 2) WORLD GEOGRAPHICAL MAPS, SHOWS NAME  
 3) BARROW AND ASSUMES POSITION STATED  
 IS FOR THAT LOCATION

Figure 1. Location of North Meadow Lake Station ( $71^{\circ}18'N$ ,  $159^{\circ}39'W$ ).

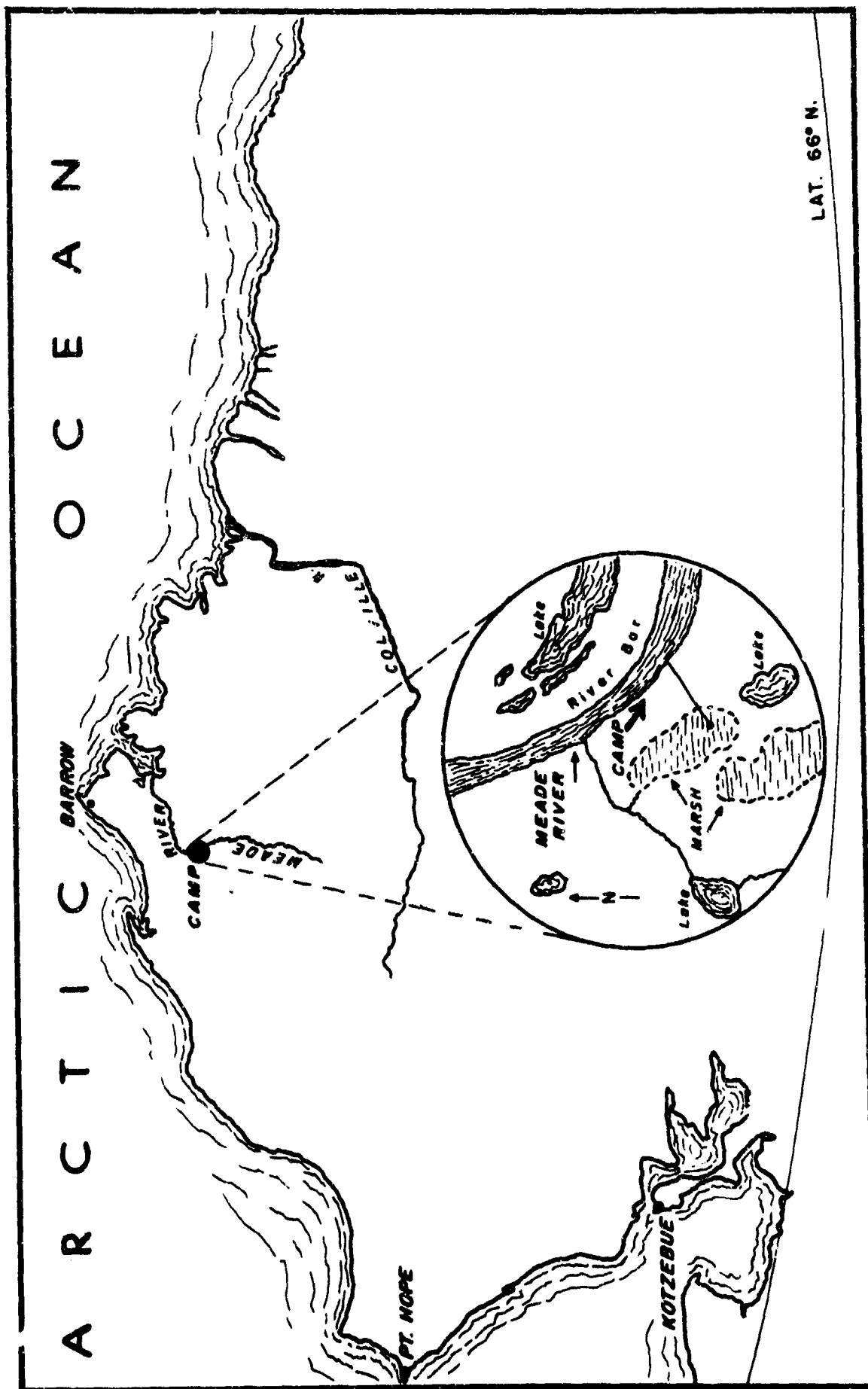


Figure 2. Location of NARL Camp on the Meade River 65 Miles SSW of Barrow (70°28'N, 157°26'W).

## II CARBON DIOXIDE OBSERVATIONS

The tables pertaining to carbon dioxide measurements are arranged in such a way that it is possible to progress from the initial calibration of reference gases to final summaries of air CO<sub>2</sub> concentrations. This report does not include hourly values of CO<sub>2</sub> for Meade River Camp or for Barrow. These values are too numerous to tabulate and are documented fully on computer output sheets.<sup>1</sup> The data on the computer sheets are given in index form, that is, provisional parts per million by volume. Conversion to the manometric form, should it be necessary to use these data on an hourly basis, is accomplished by the following equation:

$$\text{MANOMETRIC CONCENTRATION} = (C - 311.51) \times 1.2186 + 311.51 \quad (1)$$

where C is the index value.

In further discussions frequent reference will be made to Technical Report No. 2, An Analysis of Carbon Dioxide in the Arctic Atmosphere at Barrow, Alaska During 1961-62-63 by John J. Kelley, Jr., July 1966. Details of instrumentation and calibration are discussed in this report. Henceforth, reference to this report will be CO<sub>2</sub> Report, 1966. For example, reference to the manometric equation is given in the CO<sub>2</sub> Report, 1966 on page 14.

### Explanation of Tables

#### TABLE 1

This Table presents the results of all calibrations at Meade River accomplished by the Mutual Comparison Method used at the University of Washington. These data again appear in the graph at the end of TABLE 6. This table follows the format of TABLE 2 in the CO<sub>2</sub> Report, 1966.

<sup>1</sup>Computer output sheets and data cards are presently located at the Institute of Marine Science, University of Alaska, College, Alaska, 99701.

Reference Cylinder 5752 was chosen as the Primary (Io), 0221 as the Span (Is), and 7055 as the Secondary (II). The choice of 5752 as the primary was unfortunate as it appeared to have the least number of calibrations and showed the most drift, however, analytical precision at the Meade River Station was better than 1 ppm.

#### TABLE 2

Summaries of Recorder Scale Factors are based on single set evaluations. These values are arranged in periods which seem to have the greatest internal continuity. The data are selective in that the original data showed single set values exhibiting values for any one period departing greatly from the average for the period. These come under the heading of "anomalous values" and since they would seriously affect the air data, they are not used. Thus, extreme values resulting from measurement malfunction or temporary air contamination were removed from the calibration.

#### TABLE 3

TABLE 3 summarizes the mutual comparison recorder scale factors and is similar to CO<sub>2</sub> Report, 1966 TABLE 4.

#### TABLE 4

Final values for all CRREL<sup>2</sup> reference cylinders are tabulated and are similar to CO<sub>2</sub> Report, 1966 Tables 5, 6, and 7. Note the fairly wide variation in concentrations with time. University of Washington cylinders generally did not exhibit such wide variations. It is possible that these

---

<sup>2</sup>U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

variations are a result of old gas cylinders which tend to pick up moisture and small quantities of organic coatings on the inside of the cylinder. These differentially outgas during the life of the tank and produce erratic depletions or additions to the contents of the cylinder. New chrome, molybdenum steel cylinders which have been cleaned and leaked before filling should eliminate this problem of outgassing.

#### TABLE 5

Index differences used in the computation of recorder scale factors are listed.

#### TABLE 6

This Table provides a list of sliding recorder scale factors similar to CO<sub>2</sub> Report, 1966 TABLE 5. All values were corrected to 30" Hg (10.16 centibars). The procedure for reducing these data is given in CO<sub>2</sub> Report, 1966.

#### TABLE 7

Sliding recorder scale factors (RSF) are presented for the North Meadow Lake data during the period of analysis. There is much less variation in the RSF for Barrow than for Meade River. The variation at Barrow (NML) is 0.3 RSF units; at Meade River it varied about 1.8 units.

#### TABLE 8

Average daily concentrations of atmospheric CO<sub>2</sub> at the 16 meter datum level at Meade River and North Meadow Lake are given. The air indices are taken from the computer output summaries. Manometric air concentrations are calculated according to the formula. (See CO<sub>2</sub> Report, 1966). The data are plotted for North Meadow Lake and Meade River in Figures 3 and 4.

It will be noticed that the variations at North Meadow Lake closely follow those at Meade River. The summer low appears to occur in September during the 1966 season, rather than late August as in the five preceeding years.

The period of maximum change in  $\text{CO}_2$  concentrations occurs between late June and early July at both stations and is the period of maximum tundra growth. There is an apparent three-day phase lag between the two sites near the inflection point in the curves with Barrow lagging Meade River. Snow melt and plant growth was slower at Barrow than at Meade River.

#### TABLE 9

Summaries of the weekly averages of  $\text{CO}_2$  in the air at 16 meters are given and plotted in the histograms shown in Figures 4 and 5.

Early in the season Meade River showed somewhat higher values than Barrow indicating that the snow is gone and there is both production of  $\text{CO}_2$  and initial  $\text{CO}_2$  utilization by the early tundra vegetation. During May and June the Barrow area was still snow covered.

The highest differences between the two sites occurred during the week of July 4, and was 2.6 ppm, with Meade River now lower than Barrow.

#### TABLE 10

Monthly values for  $\text{CO}_2$  at Meade River and Barrow are presented.

The following mean monthly differences in  $\text{CO}_2$  measured at 16 m above the ground between the two stations was noted:

<u>Month</u>	<u>MR - NML</u>
June	+0.3 ppm
July	-1.8
August	+1.0



These data indicate a net flux of  $\text{CO}_2$  from the tundra at Meade River in June, a net utilization in July, and a net utilization for Barrow in August.

#### TABLE 11

Assuming a constant wind blowing from a given direction and a changing plant growth rate it should be possible to estimate effects of horizontal advection of  $\text{CO}_2$  near the ground. It is difficult to obtain a preferred wind orientation at both Meade River and Barrow simultaneously; however, a selection of  $\text{CO}_2$  data for winds of  $15^\circ$  and  $195^\circ$  with indicated tolerances are presented in TABLE 11.

The long term average shows almost no horizontal changes along the NML-MR  $\text{CO}_2$  transect with wind orientation by our techniques. The greatest detectable differences occurred in early July.

#### TABLE 12

The distribution of  $\text{CO}_2$  near the ground is given. These data are taken from the original computer output sheets. Graphs of the data appear at the end of the section (Figure 7 and 8).

It is immediately seen that during late May and early June at North Meadow Lake, the ground  $\text{CO}_2$  values were high. This is accounted for by the fact that these measurements were made under a cover of snow where accumulation occurs due to changing microbiological conditions in the winter, and perhaps physical changes in the active layer of the permanently frozen ground (Kelley et al., 1968).

There was a growing season phase lag of about 3 days occurring during early July. From mid-July to early August the concentrations of  $\text{CO}_2$  at Barrow and Meade River were nearly the same, while in late August and September the phase is reversed with Barrow showing effects of net utilization of  $\text{CO}_2$  by tundra.

#### TABLE 13

Weekly average concentrations of  $\text{CO}_2$  at ground level are given. The data were averaged to end each series on a Saturday corresponding to weekly vegetation measurements at Meade River. These data are shown graphically in Figures 9 and 10.

High values occurred at Barrow until June 28. This was due to  $\text{CO}_2$  entrained under the snow cover. At Meade River ambient  $\text{CO}_2$  showed values commensurate with the usual spring rise in  $\text{CO}_2$  concentration. The phase lag discussed in the description of Table 12 is seen with the crossover between Meade River and Barrow occurring early to mid-July. After this period growing season of the Barrow area accelerated and utilized more  $\text{CO}_2$  from the atmosphere near the ground than Meade River; thus, the higher Meade River  $\text{CO}_2$  levels.

#### TABLE 14

This Table gives the monthly averages for  $\text{CO}_2$  near the ground at Meade River and Barrow. Note that the June average is not used because of the anomalously high values at Barrow caused by  $\text{CO}_2$  measurements underneath the snow.

TABLE 15

Three-day running means of  $\text{CO}_2$  at Meade River and North Meadow Lake at 16 m are represented in Figures 11 and 12.

The major variations in atmospheric  $\text{CO}_2$  at 16 m between Meade River and Barrow were:

<u>Date</u>	<u>MR-NML</u>
June 2	+2.1 ppm
14	+2.3
26	-1.0
July 4	-1.5
20	-2.1
28	-0.6
August 20	+0.8
28	+2.9

In early July a three-to four-day lag was noted with Barrow lagging Meade River.

TABLE 16

Six-day running means of  $\text{CO}_2$  concentration at 16 m are given.

TABLE 17 and 18

Diurnal variations of  $\text{CO}_2$  16 m above the ground are given for the Meade River Station (Table 17) and at North Meadow Lake (Table 18) and are shown in Figures 13 and 14. It was expected that respiration at night and assimilation during the day would cause a higher  $\text{CO}_2$  concentration during the night and lower  $\text{CO}_2$  concentrations during the late afternoon. This variation is seen for the months of July and August, but not for June 1966

at Meade River. North Meadow Lake shows the expected diurnal variation for all three months.

TABLE 19

Three month combined averages of the diurnal course of  $\text{CO}_2$  for June, July and August 1966 for Meade River and Barrow are tabulated and shown in Figures 15, 16.

Figure 15 shows that minimum  $\text{CO}_2$  concentrations occur during the mid- or late afternoon at N.M.L. with an 0.8 ppm change. Meade River shows a diurnal variation with the minimum occurring during the late evening with a maximum variation of 1.5 ppm.

TABLE 20

Carbon dioxide differences between the ground and 16 meter level above the ground are shown for the North Meadow Lake and Meade River Station. The data for both stations are plotted in Figure 17.

Table 1: Recorder Scale Factors: Mutual Comparison Method  
Heade River, Alaska

Standard Tank No.	Compared Tank No.	Observed Scale Diff.	Number of Comparisons	Index Diff.	Recorder Single Set	Scale Factor Wgt'd Avg.	Date of Analysis
5752	0221	6.60	10	41.84	6.34		16 June 1966
5752	7055	6.50	10				
0221	7055	0.58	10				
5752	0221	7.08*	10*	41.84	5.91		
			20			6.12	
5752	0221	6.55	10	41.84	6.39		24 June 1966
5752	7055	5.94	10				
0221	7055	0.58	10				
5752	0221	6.52*	10*	41.84	6.42		
			20			6.40	
5752	0221	7.40	10	41.84	5.65		8 July 1966
5752	7055	6.80	10				
0221	7055	0.66	10				
5752	0221	7.46*	10*	41.84	5.61		
			20			5.63	
5752	0221	7.22	10	41.84	5.79		17 July 1966
5752	7055	6.56	10				
0221	7055	0.69	10				
5752	0221	7.25*	10*	41.84	5.77		
			20			5.78	

Table 1: Recorder Scale Factors: Mutual Comparison Method  
Meade River, Alaska

Standard Tank No.	Compared Tank No.	Observed Scale Diff.	Number of Comparisons	Index Diff.	Recorder Single Set	Scale Factor Wgt'd Avg.	Date of Analysis
5752	0221	7.08	10	41.84	5.91		24 July 1966
5752	7055	6.32	10				
0221	7055	0.73	10				
5752	0221	7.05*	10*	41.84	5.93		
			20			5.92	
Note: Machine repaired 8/8/66.							
5752	0221	6.65	10	41.84	6.29		9 August 1966
5752	7055	5.72	10				
0221	7055	0.67	10				
5752	0221	6.39*	10*	41.84	6.55		
			20			6.42	
5752	0221	7.04	10	41.84	5.94		30 August 1966
5752	7055	6.40	10				
0221	7055	0.68	10				
5752	0221	7.08*	10*	41.84	5.91		
			20			5.92	
5752	0221	7.54	10	41.84	5.55		9 September 1966
5752	7055	6.67	10				
0221	7055	0.68	10				
5752	0221	7.35*	10*	41.84	5.69		
			20			5.62	

Table 2: Summary of Recorder Scale Factors  
Meade River, Alaska

Standard Tank No.	• Compared Tank No.	Observed Scale Diff.	Number of Comparisons	Recorder Scale Factor Single Set Bar. Press(mb)	Adjusted Recorder Scale Factor	Date of Analysis
2015	5752	4.23	1	4.75	4.78	25 May 1966
5752	5532	4.70	1	5.41	5.44	
2015	5532	8.24	1	5.52	5.55	
				Average R.S.F. =	5.26	
0221	3732	4.39	1	4.84	4.85	26 May 1966
3732	2156	2.00	1	3.82	3.83	
2156	5752	2.40	4	5.39	5.41	
2015	5752	4.39	1	4.57	4.58	
				Average R.S.F. =	4.67	
0221	5752	8.98	2	4.66	4.63	27 May 1966
7055	2015	3.84	3	4.65	4.62	
7055	3732	3.67	7	4.65	4.62	
				Average R.S.F. =	4.62	
0221	5752	7.05	10	5.93	5.89	7 June 1966
0221	3732	3.47	5	6.13	6.09	
3732	5752	3.55	4	5.79	5.76	
7055	5752	6.47	3	5.86	5.82	
				Average R.S.F. =	5.89	
7055	3732	2.83	1	6.03	6.03	8 June 1966
7055	2015	2.97	10	6.01	6.01	

Table 2: Summary of Recorder Scale Factors  
Meade River, Alaska

Standard Tank No.	Compared Tank No.	Observed Scale Diff.	Number of Comparisons	Recorder Scale Factor Single Set. Bar. Press(mb)	Adjusted Recorder Scale Factor	Date of Analysis
7055	3732	2.76	7	6.18	6.18	
				Average R.S.F. =	6.07	
7055	3732	2.78	3	6.14	6.19	9 June 1966
7055	3732	2.80	7	6.10	6.19	10 June 1966
7055	3732	2.90	5	5.89	5.95	11 June 1966
7055	3732	2.78	11	6.14	6.17	12 June 1966
7055	3732	2.71	13	6.30	6.32	13 June 1966
7055	3732	2.79	6	6.12	6.13	14 June 1966



Table 3: Summary of Recorder Scale Factors - Mutual Comparison Method  
Meade River, Alaska

Standard Tank No.	Compared Tank No.	Number of Comparisons	Scale Factor Average	Bar. Press. mb	Adjusted R.S.F.	Date of Analysis
5752	0221	10	6.34			16 June 1966
5752	7055	10	6.09			
0221	7055	10	6.21	10.12	6.23	
5752	0221	20	6.40	09.98	6.52	24 June 1966
5752	0221	20	5.63	10.06	5.70	8 July 1966
5752	0221	20	5.78	10.09	5.82	17 July 1966
5752	0221	20	5.92	10.26	5.86	24 July 1966
5752	0221	20	6.42	10.24	6.37	9 August 1966
5752	0221	20	5.92	10.16	5.93	30 August 1966
5752	0221	20	5.62	10.14	5.63	9 September 1966

Table 4: Index Values of Reference Gases  
Meade River, Alaska

Tank	2156	41133	41862	380026	47055	5532	5752	63732	0221	2015
Use	II†	W <sub>2</sub>	W <sub>3</sub>	*	II	II†	I	W <sub>1</sub>	IHS	W <sub>4</sub>
U.W.1	300.40	305.25	301.58	228.90	325.01			307.93	328.91	307.41
N.M.L.	300.08	305.85	302.88		325.42	262.17	287.33	308.71	329.45	
M.R.		304.37			325.29			308.50		
					325.19			307.28		
					325.29					
U.W.2	300.31	306.08	302.95		325.35	261.62		308.56	329.16	
Average										
Index	300.26	305.39	302.47	228.90	325.26	261.89	287.33	308.19	329.17	307.41

\*Not used.

II† Occasional secondary reference.

Table 5: Index Differences of Reference Cases Used to Determine Recorder Scale Factors - Meade River, Alaska

<u>Standard Tank</u>	<u>Compared Tank</u>	<u>Index Differences</u>
3732	5752	20.86
0221	7055	2.25
2015	5752	20.08
5752	5532	25.44
2015	5532	45.52
2156	5752	12.93
3732	2156	7.93
0221	3732	21.27
7055	3732	18.73
7055	2015	19.51
0221	5752	41.84
7055	5752	39.59

Table 6: Summary of Recorder Scale Factors - Sliding Recorder  
Scale Factors. Meade River, Alaska

<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>	<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>	<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>
May 25	5.26	June 18	6.48	July 12	5.70
26	4.67	19	6.49	13	5.70
27	4.65	20	6.50	14	5.70
28	5.00	21	6.50	15	5.70
29	5.15	22	6.50	16	5.70
30	5.30	23	6.50	17	5.72
31	5.50	24	6.50	18	5.73
		25	6.47	19	5.75
June 1	5.65	26	6.45	20	5.75
2	5.80	27	6.37	21	5.80
3	5.85	28	6.30	22	5.85
4	5.90	29	6.25	23	5.87
5	5.95	30	6.20	24	5.90
6	6.00			25	5.95
7	6.07	July 1	6.10	26	5.97
8	6.15	2	6.00	27	6.00
9	6.20	3	5.95	28	6.00
10	6.25	4	5.90	29	6.05
11	6.27	5	5.85	30	6.10
12	6.30	6	5.80	31	6.10
13	6.35	7	5.75		
14	6.40	8	5.70	August 1	6.10
15	6.43	9	5.70	2	6.15
16	6.45	10	5.70	3	6.17
17	6.47	11	5.70	4	6.20

Table 6: Summary of Recorder Scale Factors - Sliding Recorder  
Scale Factors. Meade River, Alaska

<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>	<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>
August 5	6.25	August 30	5.90
6	6.27	31	5.88
7	6.30		
8	6.30	September 1	5.85
9	6.30	2	5.80
10	6.30	3	5.80
11	6.30	4	5.75
12	6.30	5	5.75
13	6.30		
14	6.30		
15	6.30		
16	6.25		
17	6.25		
18	6.20		
19	6.15		
20	6.15		
21	6.15		
22	6.10		
23	6.10		
24	6.10		
25	6.10		
26	6.10		
27	6.00		
28	5.90		
29	5.90		

Table 7: Smoothed Recorder Scale Factors for Barrow CO<sub>2</sub> Analyzer  
Barrow, Alaska (North Meadow Lake)

<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>	<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>	<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>
May 24	3.93	June 17	3.91	July 11	3.88
25	3.93	18	3.90	12	3.88
26	3.93	19	3.90	13	3.88
27	3.93	20	3.90	14	3.88
28	3.93	21	3.90	15	3.88
29	3.93	22	3.90	16	3.87
30	3.93	23	3.90	17	3.87
31	3.93	24	3.90	18	3.87
		25	3.89	19	3.87
June 1	3.93	26	3.89	20	3.87
2	3.93	27	3.89	21	3.87
3	3.93	28	3.89	22	3.87
4	3.93	29	3.89	23	3.87
5	3.93	30	3.89	24	3.87
6	3.92			25	3.87
7	3.92	July 1	3.89	26	3.88
8	3.92	2	3.89	27	3.88
9	3.92	3	3.89	28	3.88
10	3.92	4	3.88	29	3.89
11	3.91	5	3.88	30	3.89
12	3.91	6	3.88	31	3.89
13	3.91	7	3.88		
14	3.91	8	3.88	August 1	3.90
15	3.91	9	3.88	2	3.90
16	3.91	10	3.88	3	3.90

Table 7: Smoothed Recorder Scale Factors for Barrow CO<sub>2</sub> Analyzer  
Barrow, Alaska (North Meadow Lake)

<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>	<u>Date</u> <u>1966</u>	<u>Recorder</u> <u>Scale</u> <u>Factor</u>
4	3.91	August 29	4.01
5	3.91	30	4.01
6	3.92	31	4.02
7	3.92		
8	3.93	September 1	4.02
9	3.94	2	4.02
10	3.94	3	4.02
11	3.95	4	4.02
12	3.96	5	4.02
13	3.96	6	4.02
14	3.96	7	4.02
15	3.97	8	4.02
16	3.97	9	4.02
17	3.97	10	4.02
18	3.98		
19	3.98		
20	3.98		
21	3.98		
22	3.99		
23	3.99		
24	3.99		
25	4.00		
26	4.00		
27	4.00		
28	4.01		

Table 8: Daily Average Index of Carbon Dioxide (ppm) 16 meters  
Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
May 24, 1966				
25	322.9	325.4	321.3	323.4
26	322.9	325.4	320.9	322.9
27	321.1	323.2	320.9	322.9
28	319.7	321.5	321.0	323.1
29	321.3	323.4	321.1	323.2
30	322.6	325.0	321.2	323.4
31	323.3	325.9	321.6	323.8
	324.3	327.1	322.1	324.4
June 1	323.0	325.5	321.3	323.4
2	321.9	324.2	321.2	323.3
3	319.9	321.7	321.2	323.3
4	320.9	322.9	320.8	322.8
5	322.6	325.0	-----	-----
6	320.4	322.3	321.0	323.1
7	321.6	323.8	321.0	323.1
8	320.8	322.8	320.9	322.9
9	321.3	323.4	320.9	322.9
10	321.4	323.6	320.7	322.7
11	321.4	323.6	-----	-----



Table 8: Daily Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

16 meters

Date	Meade River		CO <sub>2</sub> Concentration		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)	Index	Manometric(ppm)
June 12, 1966	321.3	323	-----	-----	-----	-----
13	322.9	325.4	-----	-----	-----	-----
14	321.1	323.2	320.1	322.0	322.0	322.0
15	-----	-----	320.5	322.5	322.5	322.5
16	321.1	323.2	320.5	322.5	322.5	322.5
17	320.9	322.9	320.2	322.1	322.1	322.1
18	320.0	321.9	-----	-----	-----	-----
19	320.1	322.0	320.0	321.9	321.9	321.9
20	320.3	322.2	320.0	321.9	321.9	321.9
21	320.6	322.6	320.3	322.2	322.2	322.2
22	318.8	320.4	319.1	320.8	320.8	320.8
23	319.3	321.0	319.4	321.1	321.1	321.1
24	317.5	318.8	318.8	320.4	320.4	320.4
25	319.0	320.6	319.9	321.7	321.7	321.7
26	319.1	320.8	318.8	320.4	320.4	320.4
27	318.8	320.4	319.3	321.0	321.0	321.0
28	318.3	319.8	318.1	319.5	319.5	319.5
29	317.2	318.4	318.7	320.3	320.3	320.3
30	317.3	318.6	317.5	318.8	318.8	318.8

Table 8: Daily Average Index of Carbon Dioxide (ppm)  
 Manometric Concentration Scale

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
July 1, 1966	316.8	318.0	317.4	318.7
2	317.0	318.2	318.5	320.0
3	317.7	319.0	318.6	320.1
4	316.9	318.1	318.2	319.7
5	315.8	316.7	318.5	320.0
6	315.7	316.6	318.3	319.8
7	315.0	315.8	317.1	318.3
8	312.6	312.8	315.7	316.6
9	313.0	313.3	314.5	315.1
10	315.1	315.9	316.3	317.3
11	312.5	312.7	314.4	315.0
12	311.8	311.9	314.2	314.8
13	314.5	315.1	313.8	314.3
14	312.0	312.1	313.4	313.8
15	312.4	312.6	312.0	312.1
16	312.0	312.1	312.4	312.6
17	310.7	310.5	313.3	313.7
18	312.6	312.8	314.5	315.1
19	310.9	310.8	313.5	313.9
20	312.8	313.1	312.5	312.7

Table 8: Daily Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
July 21, 1966	311.1	311.0	310.9	310.8
22	310.5	310.3	314.1	314.7
23	312.1	312.2	313.8	314.3
24	312.3	312.5	313.3	313.7
25	313.7	314.2	314.0	314.5
26	313.5	313.9	314.1	314.7
27	313.7	314.2	314.2	314.8
28	314.0	314.5	314.2	314.8
29	313.2	313.6	313.4	313.8
30	312.6	312.8	313.0	313.3
31	311.4	311.4	310.9	310.8
August 1, 1966	311.4	311.4	312.0	312.1
2	309.5*	309.1*	312.3	312.5
3	308.8*	308.2*	312.1	312.2
4	308.1*	307.3*	311.8	311.9
5	309.5*	309.1*	311.3	311.2
6	308.3*	307.6*	311.5	311.5
7	308.6*	308.0*	311.7	311.7
8	312.7	313.0	312.0	312.1

\*not used.

Table 8: Daily Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
August 9, 1966	312.5	312.7	311.4	311.4
10	312.5	312.7	311.5	311.5
11	312.4	312.6	311.1	311.0
12	312.4	312.6	311.1	311.0
13	312.6	312.8	311.1	311.0
14	312.5	312.7	311.1	311.0
15	311.2	311.1	310.2	309.9
16	311.0	310.9	310.5	310.3
17	311.4	311.4	310.2	309.9
18	311.1	311.0	310.2	309.9
19	310.5	310.3	310.3	310.0
20	311.1	311.0	310.7	310.5
21	311.9	312.0	311.3	311.2
22	311.3	311.2	310.9	310.8
23	313.5	313.9	310.9	310.8
24	310.9	310.8	310.8	310.6
25	313.6	314.1	310.9	310.8
26	312.5	312.7	311.9	312.0
27	314.7	315.4	311.2	311.1
28	310.6	310.4	310.1	309.6

Table 8: Daily Average Index of Carbon Dioxide (ppm)  
 Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
August 29, 1966	309.9	309.5	310.1	309.8
	310.2	309.9	310.2	309.9
	310.4	310.2	310.3	310.0
September 1, 1966	310.0	309.7	310.3	310.0
	309.7	309.3	310.0	309.7
	309.9	309.5	310.1	309.8
	309.6	309.2	309.7	309.3
	311.2	311.1	310.9	310.8
	310.4	310.2	311.5	311.5
	309.6	309.2	309.8	309.4
	312.1	312.2	311.3	311.2
	309.8	309.4	310.3	310.0
	310.0	309.7	310.9	310.8

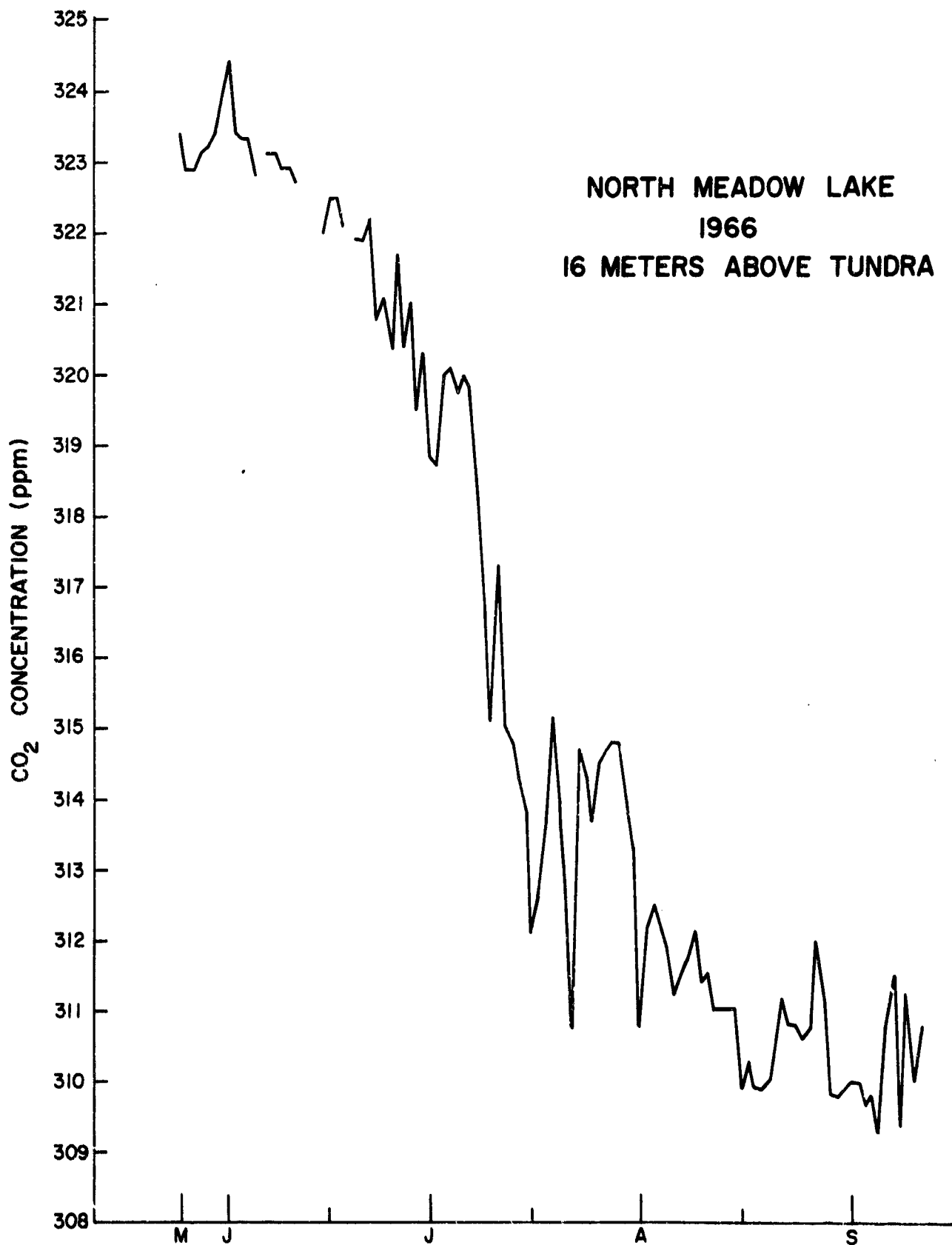


Figure 3. Daily Average CO<sub>2</sub> Concentration (ppm) at 16 m, North Meadow Lake, 1966.

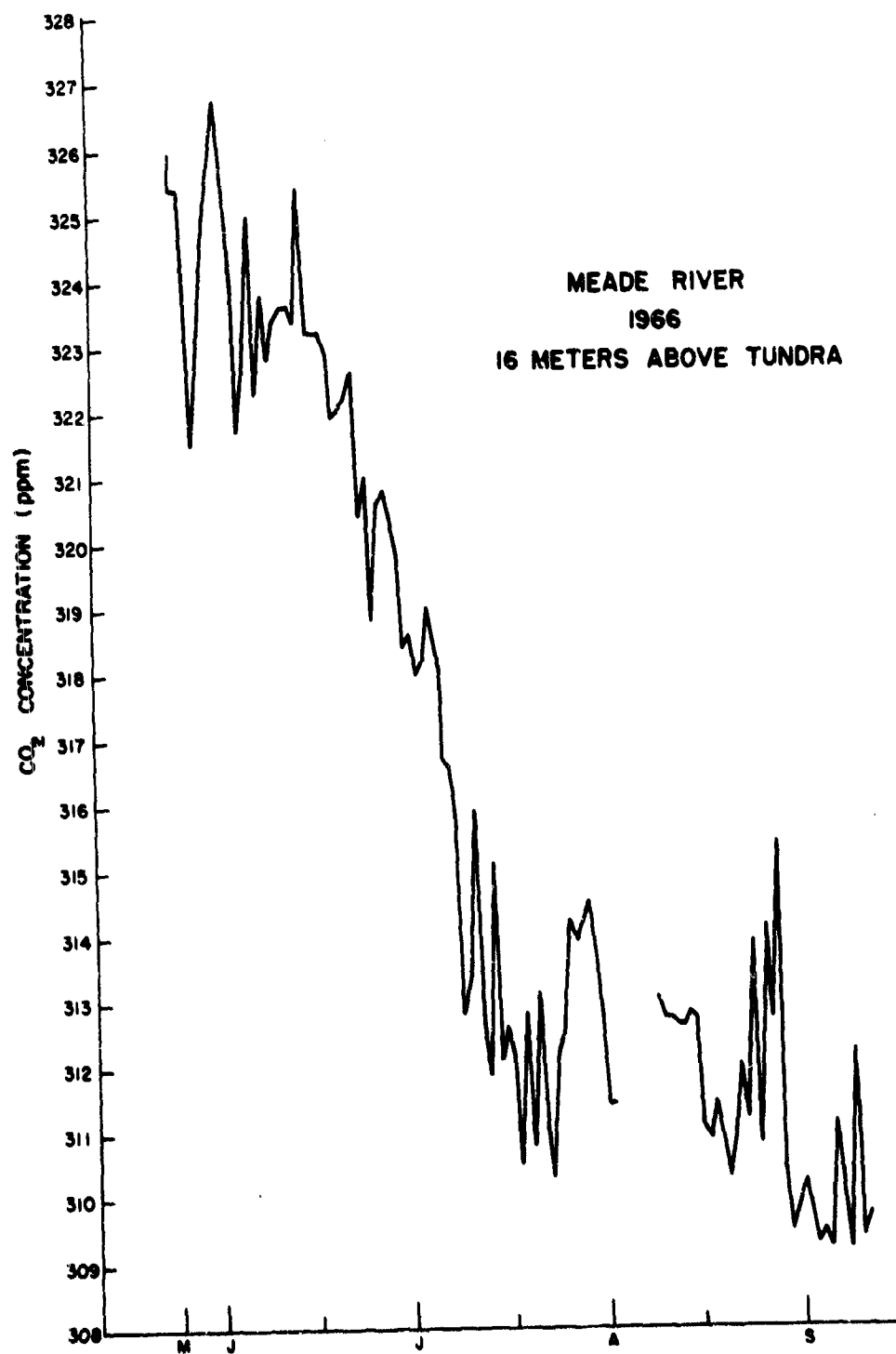


Figure 4. Daily Average CO<sub>2</sub> Concentration (ppm) at 16 m, North Meade River, 1966.

Table 9: Weekly Average Index of Carbon Dioxide (ppm)  
 Manometric Concentration Scale

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
5/22 - 5/28, 1966	321.6	323.8	321.0	323.1
5/29 - 6/4	322.3	324.6	321.4	323.5
6/5 - 6/11	321.3	323.5	320.9	322.9
6/12 - 6/18	321.2	323.3	320.3	322.3
6/19 - 6/25	319.4	321.1	319.6	321.4
6/26 - 7/2	317.8	319.2	318.3	319.8
7/3 - 7/9	315.2	316.0	317.3	318.5
7/10 - 7/16	312.9	313.2	313.8	314.3
7/17 - 7/23	311.5	311.5	313.2	313.6
7/24 - 7/30	313.3	313.7	313.7	314.2
7/31 - 8/6	311.4	311.4	311.7	311.7
8/7 - 8/13	312.5	312.7	311.4	311.4
8/14 - 8/20	311.2	311.2	310.5	310.2
8/21 - 8/27	312.6	312.9	311.1	311.0
8/28 - 9/3	310.1	309.8	310.2	309.9
9/4 - 9/10	310.4	310.1	310.6	310.4



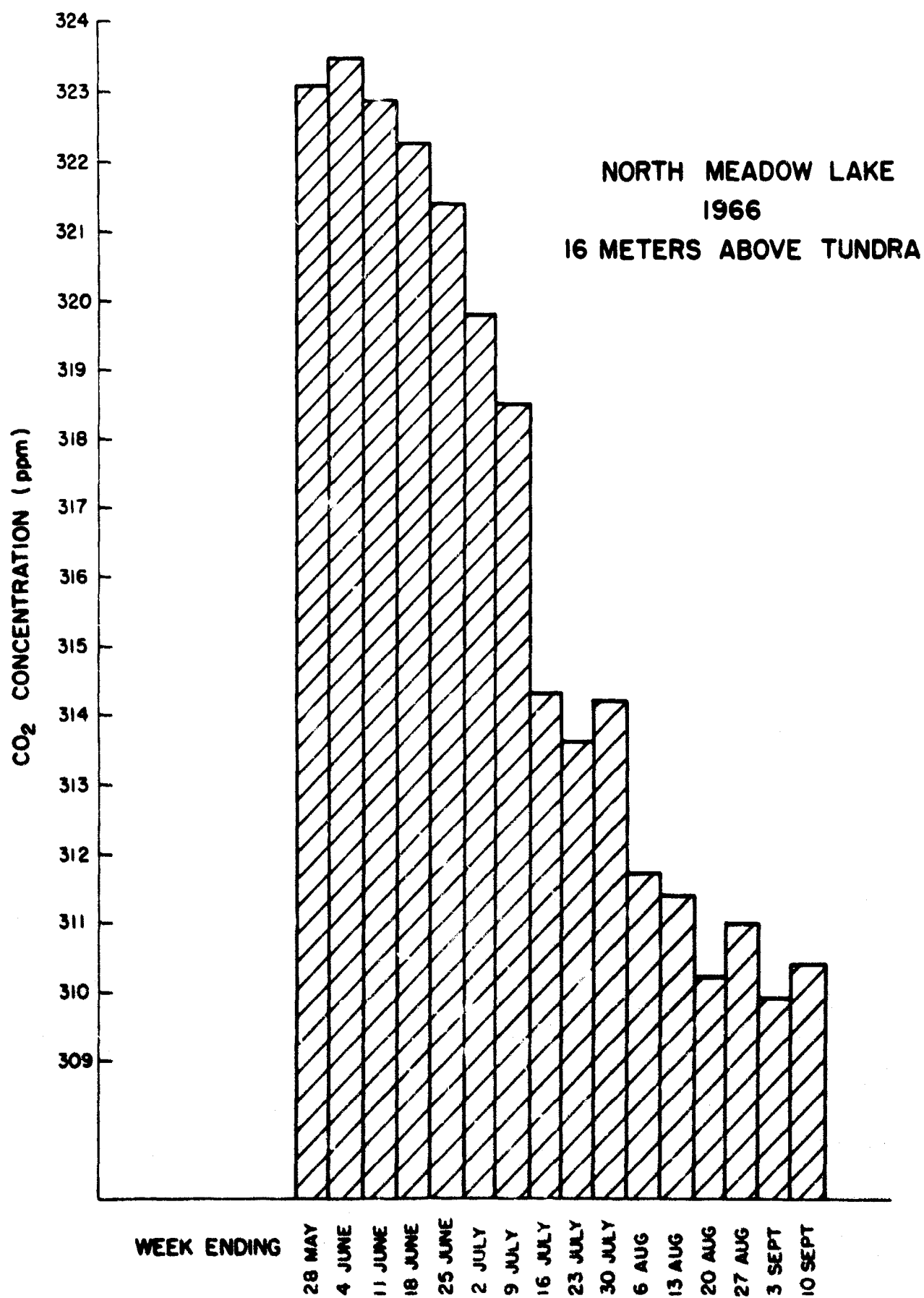


Figure 5. Weekly Average CO<sub>2</sub> Concentration (ppm) at 16 m, North Meadow Lake, 1966.

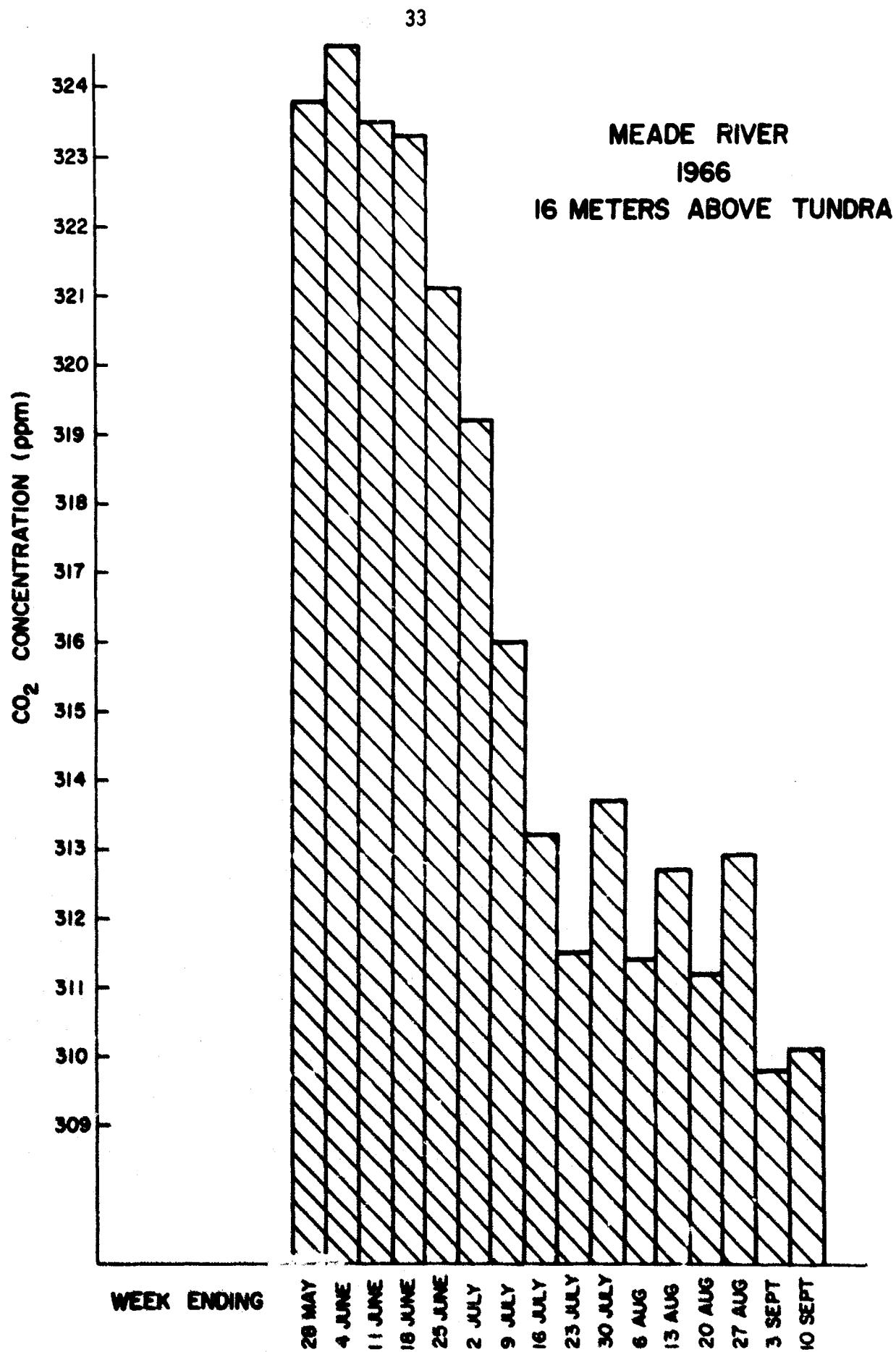


Figure 6. Weekly Average CO<sub>2</sub> Concentration (ppm) at 16 m, Meade River, 1966.

Table 10: Monthly Average Index of Carbon Dioxide (ppm) - Manometric Concentration Scale  
Weade River and North Meadow Lake, Alaska

<u>Date</u>	16 meters	
	<u>CO<sub>2</sub> Concentration Manometric (ppm)</u> <u>Weade River</u>	<u>North Meadow Lake</u>
1966		
June		
July	322.2	321.9
August	313.8	315.3
	311.9	310.9
Average	316.0	316.0

Table 11: Concentration of CO<sub>2</sub> with Wind Direction  
Yeade River and North Meadow Lake, Alaska

Date	15° (360 to 70)			
	CO <sub>2</sub> Concentration		North Meadow Lake	
	Yeade River Index	Manometric(ppm)	Index	Manometric(ppm)
July 2, 1966	318.5	320.0	317.0	318.2
7	317.1	318.3	315.0	315.8
12	314.2	314.8	311.8	311.9
23	313.9	314.4	312.1	312.2
26	314.1	314.7	313.5	313.9
27	314.2	314.8	317.7	314.2
August 8	311.9	312.0	312.7	313.0
9	311.4	311.4	312.5	312.7
17	310.2	309.9	311.4	311.4
18	310.2	309.9	311.1	311.0
19	310.3	310.0	310.5	310.3
20	310.7	310.5	311.1	311.0
28	310.1	309.8	310.5	310.4
29	310.1	309.8	309.9	309.6
30	310.2	309.9	310.2	309.9
31	310.3	310.0	310.4	310.2
September 1	310.3	310.0	310.0	309.7
2	310.0	309.7	309.8	309.4
Average	312.1	312.2	311.9	311.9

Table 11: Concentration of CO<sub>2</sub> with Wind Direction  
 Meade River and North Meadow Lake, Alaska

1950 (140 to 210)

Date	CO <sub>2</sub> Concentration	
	Meade River Index	North Meadow Lake Index
June 20, 1966	319.9	320.3
	320.3	320.6
	318.6	317.2
July 9	314.5	313.0
	313.5	310.9
	310.9	313.6
August 25	311.9	312.6
	315.7	315.5
	316.6	316.3
Average		

Table 12: Daily Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
May 24, 1966	323.2	325.8	329.2	333.1
25	322.9	325.4	339.6	345.7
26	321.1	323.2	340.3	346.6
27	320.7	322.7	338.4	344.3
28	321.8	324.1	342.4	349.1
29	322.7	325.2	342.1	8.8
30	324.5	327.3	344.4	351.6
31	324.8	327.7	341.5	348.1
June 1, 1966	323.2	325.8	334.7	339.8
2	322.6	325.0	333.8	338.7
3	320.3	322.2	363.0	374.3
4	322.2	324.5	403.3	423.4
5	323.4	326.0	-----	-----
6	320.7	322.7	366.8	378.9
7	321.4	323.6	347.9	355.8
8	320.9	323.0	373.6	387.2
9	321.3	323.4	375.1	389.0
10	322.1	324.4	383.9	399.7
11	322.2	324.5	-----	-----
12	322.7	325.2	-----	-----

Table 12: Daily Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration			Ground Level	
	Meade River Index	Manometric(ppm)	North Meade Lake Index	Manometric(ppm)	
June 13, 1966	323.8	326.5	-----	-----	
14	322.5	324.9	321.4	323.6	
15	-----	-----	323.1	325.6	
16	323.0	325.5	321.2	323.2	
17	321.7	323.9	320.2	322.1	
18	320.5	322.5	-----	-----	
19	320.7	322.7	355.6	365.2	
20	320.5	322.5	334.0	338.9	
21	321.3	323.4	329.0	332.8	
22	321.2	323.3	319.9	321.7	
23	319.4	321.1	337.3	342.9	
24	318.4	319.9	337.9	343.7	
25	319.7	321.5	320.3	322.2	
26	319.5	321.3	318.8	320.4	
27	319.5	321.3	319.9	321.7	
28	322.0	324.3	318.7	320.3	
29	317.8	319.2	319.5	321.2	
30	318.1	319.5	318.2	319.7	

Table 12: Daily Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration			Ground Level
	Meade River Index	Manometric(ppm)	North Meadow Lake Index	Manometric(ppm)
July 1, 1966	316.7	317.8	317.3	318.6
2	317.3	318.6	318.5	320.0
3	317.2	318.4	318.6	320.1
4	316.9	318.1	318.2	319.7
5	315.7	316.6	318.5	320.0
6	316.2	317.2	319.7	321.5
7	314.4	315.0	319.9	321.7
8	313.1	313.5	316.0	317.0
9	313.0	313.3	314.1	314.7
10	314.6	315.3	316.3	317.3
11	312.1	312.2	314.5	315.1
12	312.4	312.6	314.0	314.5
13	315.2	316.0	313.6	314.1
14	311.8	311.9	313.1	313.4
15	311.6	311.6	311.3	311.2
16	312.6	312.8	312.2	312.3
17	310.5	310.3	312.8	313.1
18	313.0	313.3	313.9	314.4
19	312.8	313.1	315.0	315.8
20	314.1	314.7	313.7	314.2



Table 12: Daily Average Index of Carbon Dioxide (ppm) Ground Level  
 Manometric Concentration Scale

Date	Meade River		CO <sub>2</sub> Concentration		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)	Index	Manometric(ppm)
July 21, 1966	310.9	310.8	310.3	310.0		
22	309.9	309.6	313.7	314.2		
23	312.7	313.0	313.9	314.4		
24	310.4	310.2	312.4	312.6		
25	313.2	313.6	310.8	310.6		
26	313.8	314.3	313.5	313.9		
27	313.8	314.3	313.5	313.9		
28	314.4	315.0	313.9	314.4		
29	313.8	314.3	313.4	313.8		
30	312.2	312.4	312.9	313.2		
31	312.9	313.2	311.0	310.9		
August 1	313.6	314.1	311.5	311.5		
2	317.7*	319.1*	312.1	312.2		
3	309.4*	308.9*	311.7	311.7		
4	308.1*	307.4*	311.3	311.2		
5	310.5*	310.3*	310.8	310.6		
6	308.3*	307.6*	311.1	311.0		
7	308.9*	308.3*	311.4	311.4		
8	313.7	314.2	312.0	312.1		

\*lot used.

Table 12: Daily Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration				Ground Level	
	Meade River		North Meadow Lake			
	Index	Manometric(ppm)	Index	Manometric(ppm)		
August 9, 1965	312.7	313.0	310.8	310.6		
10	313.0	313.3	311.3	311.2		
11	312.6	312.8	311.0	310.9		
12	312.8	313.1	311.0	310.9		
13	313.1	313.5	311.2	311.1		
14	318.0	319.4	311.2	311.1		
15	312.9	313.2	310.3	310.0		
16	311.7	311.7	310.4	310.2		
17	312.3	312.5	310.3	310.0		
18	312.1	312.2	310.1	309.8		
19	311.2	311.1	310.3	310.0		
20	312.3	312.5	311.3	311.2		
21	314.8	315.5	312.7	313.0		
22	318.1	319.5	311.6	311.6		
23	318.9	320.5	311.3	311.2		
24	312.6	312.8	311.5	311.5		
25	315.1	315.9	314.3	314.9		
26	314.3	314.9	313.4	313.8		
27	319.6	321.4	311.8	311.9		
28	311.6	311.6	310.3	310.0		
29	310.4	310.2	310.4	310.2		

Table 12: Daily Average Index of Carbon Dioxide (ppm)      Ground Level  
Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration		North Meadow Lake	
	Meade River Index	Manometric(ppm)	Index	Manometric(ppm)
August 30, 1966				
31	311.0	310.9	310.5	310.3
	311.0	310.9	310.5	310.3
September 1, 1966				
2	310.5	310.3	310.3	310.0
3	310.1	309.8	310.1	309.8
4	310.3	310.0	310.1	309.8
5	312.9	313.2	310.3	310.0
6	318.5	320.0	314.9	315.6
7	311.8	311.9	313.0	313.3
8	311.2	311.1	310.2	309.9
9	313.0	313.3	311.7	311.7
10	310.7	310.5	310.6	310.4
	310.8	310.6	311.0	310.9

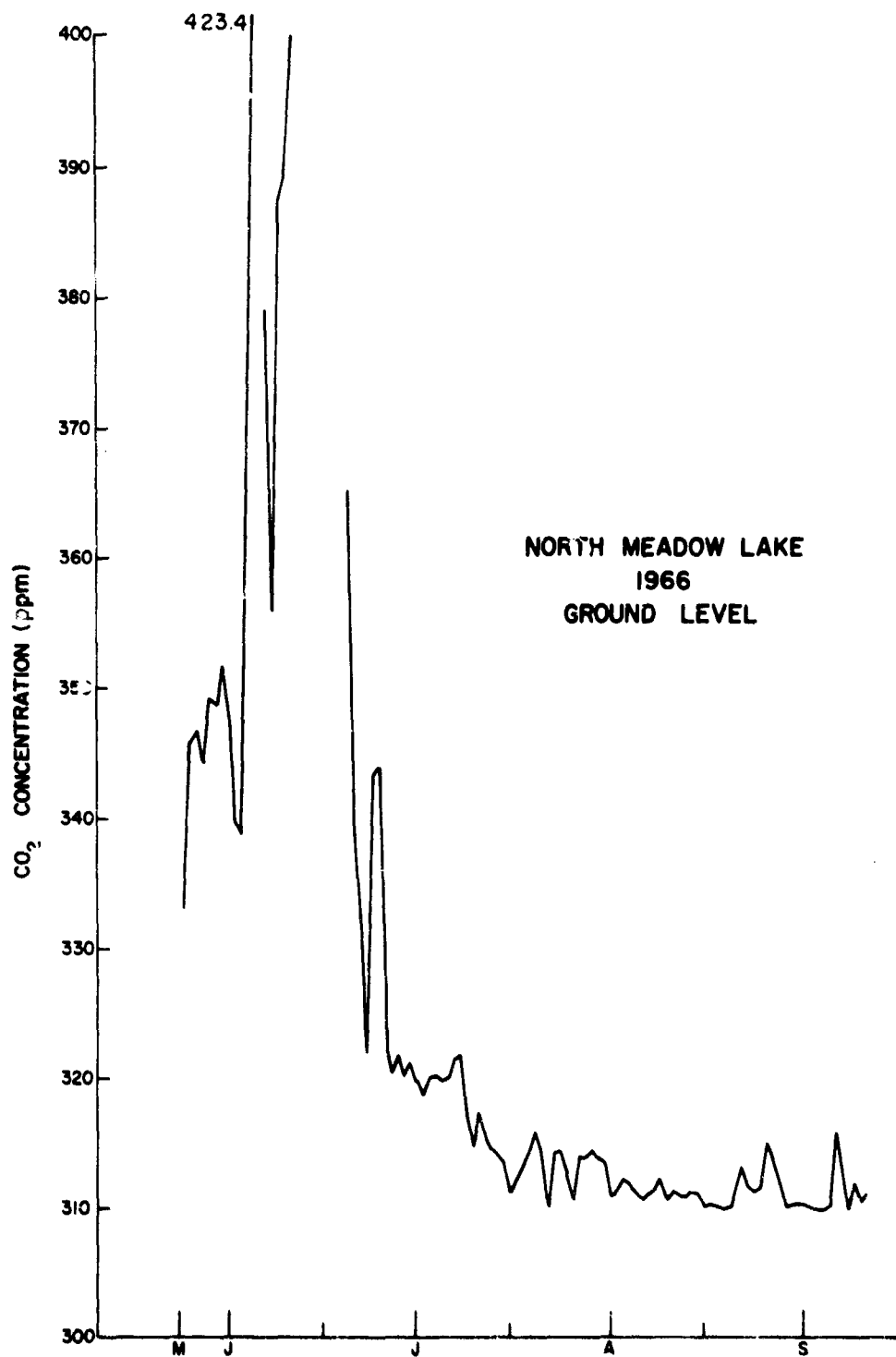


Figure 7. Daily Average CO<sub>2</sub> Concentration (ppm) at Ground Level, North Meadow Lake, 1966.

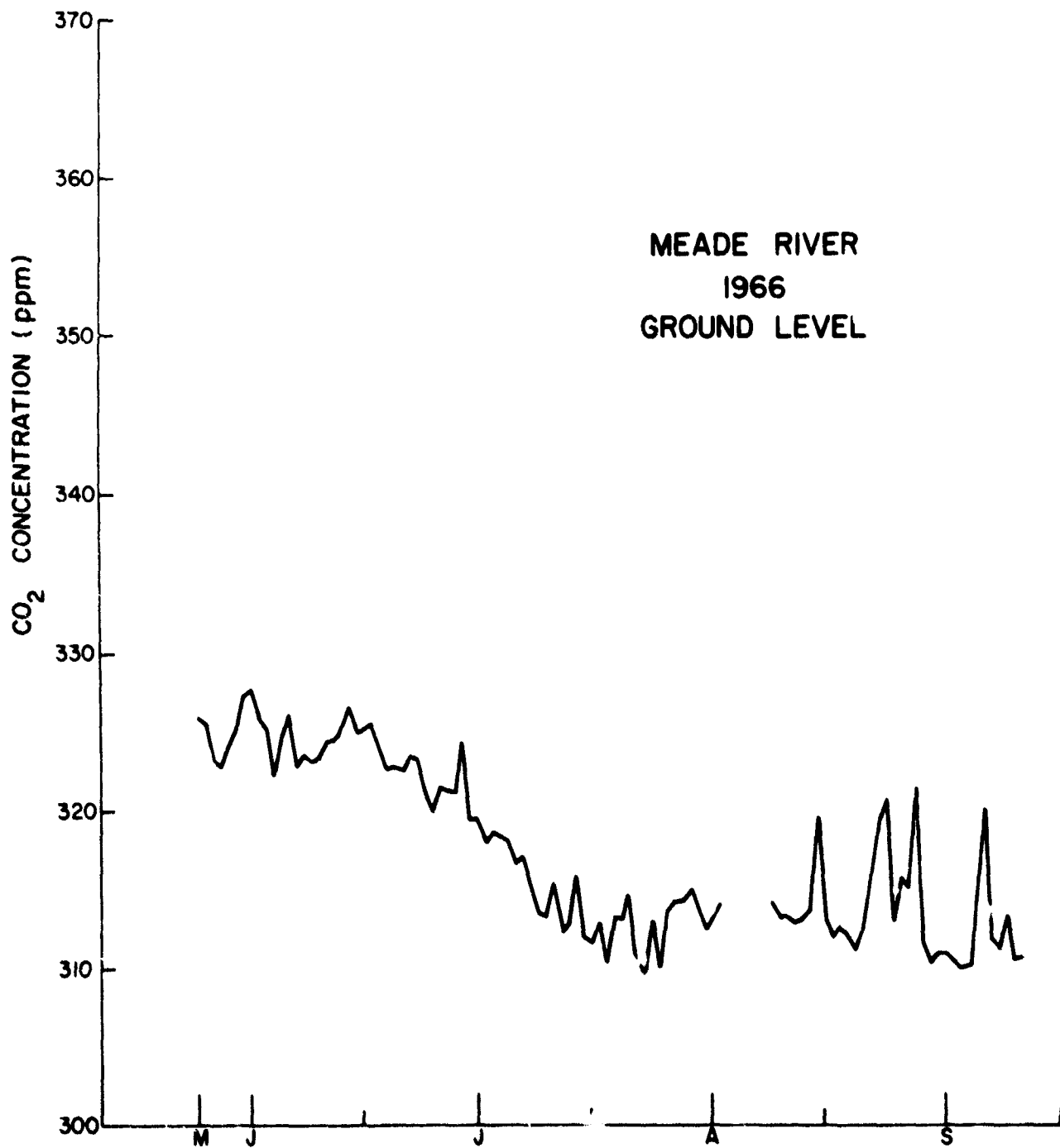


Figure 8. Daily Average CO<sub>2</sub> Concentration (ppm) at Ground Level, Meade River, Alaska, 1966.

Table 13: Weekly Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

Date	CO <sub>2</sub> Concentration			Ground Level
	Meade River Index	Manometric(ppm)	North Meadow Lake Index	Manometric(ppm)
1966				
5/22-5/28	321.9	324.2	338.0	343.8
5/29-6/4	322.9	325.4	351.8	360.7
6/5-6/11	321.7	323.9	369.5	382.1
6/12-6/18	322.4	324.7	321.5	323.6
6/19-6/25	320.2	322.0	333.4	338.2
6/26-7/2	318.7	320.3	318.7	320.3
7/3-7/9	315.2	316.0	317.8	319.2
7/10-7/16	312.9	313.2	313.6	314.0
7/17-7/23	312.0	312.1	313.3	313.7
7/24-7/30	313.1	313.4	312.9	313.2
7/31-8/6	313.2	313.6	311.3	311.3
8/7-8/13	313.0	313.3	311.2	311.2
8/14-8/20	312.9	313.7	310.5	310.3
8/21-8/27	316.2	317.2	312.4	312.5
8/28-9/3	310.7	310.5	310.3	310.0
9/4-9/10	312.7	312.9	311.7	311.7

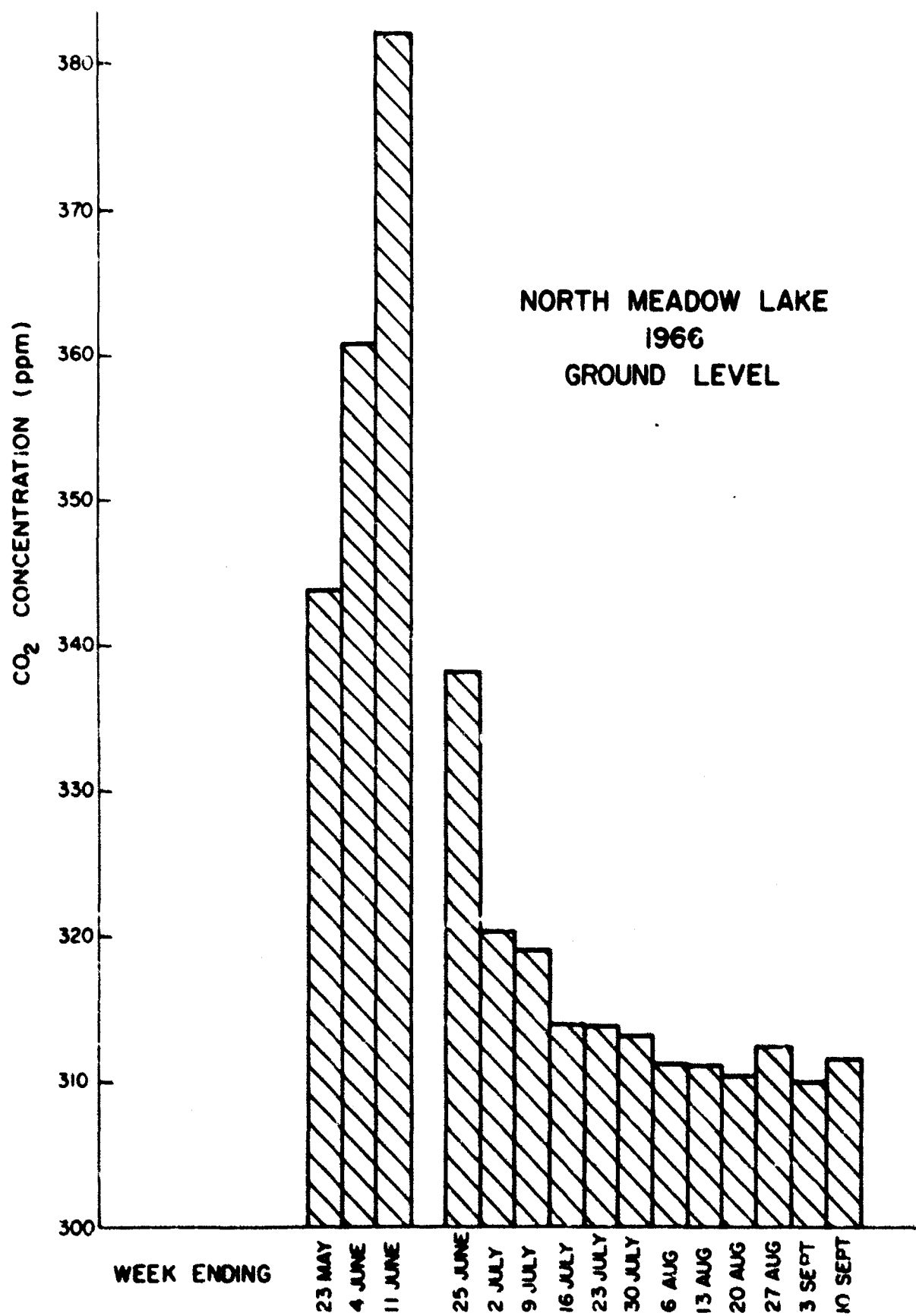


Figure 9. Weekly Average Concentration (ppm) at Ground Level, North Meadow Lake, 1966.

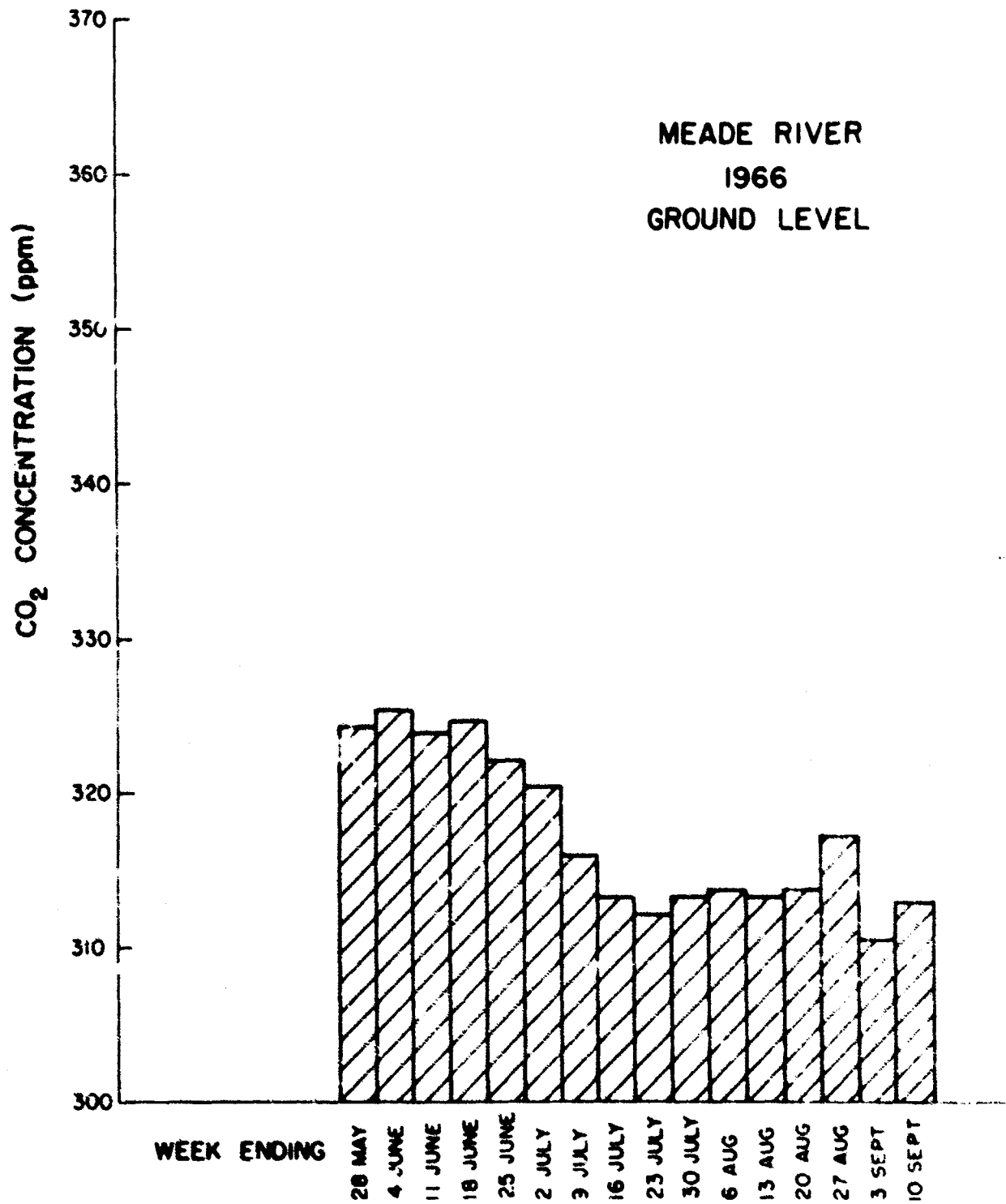


Figure 10. Weekly Average Concentration (ppm) at Ground Level, Meade River, 1966.



Table 14: Monthly Average Index of Carbon Dioxide (ppm)  
Manometric Concentration Scale

<u>Date</u>	<u>CO<sub>2</sub> Concentration</u>		<u>Ground Level</u>	
	<u>Meade River</u> <u>Index</u>	<u>Manometric(ppm)</u>	<u>North Meadow Lake</u> <u>Index</u>	<u>Manometric(ppm)</u>
1966				
June	321.1	323.2	339.9	346.1*
July	313.6	314.0	314.6	315.2
August	313.6	314.0	311.3	311.2
Average	316.1	317.1	321.9	324.2
Average for July, August	313.6	314.0	312.9	313.2

\* CO<sub>2</sub> in air sampled under a snow cover.

Table 15: Three Day Running Mean Concentration of Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
May 26, 1966	322.3	324.7	321.0	323.1
27	321.2	323.3	320.9	322.9
28	320.7	322.7	321.0	323.1
29	321.2	323.3	321.1	323.2
30	322.4	324.8	321.3	323.4
31	323.4	326.0	321.7	323.9
49				
June 1, 1966	323.5	326.1	321.7	323.9
2	323.1	325.6	321.5	323.7
3	321.6	323.8	321.2	323.3
4	320.9	322.9	321.1	323.2
5	321.1	323.2	321.0	323.1
6	321.3	323.4	320.9	322.9
7	321.5	323.7	321.0	323.1
8	320.9	322.9	321.0	323.1
9	321.2	323.3	320.9	322.9
10	321.2	323.3	320.8	322.8
11	321.4	323.6	320.8	322.8
12	321.4	323.6	320.7	322.7
13	321.9	324.2	-----	-----
14	321.8	324.0	320.1	322.0

Table 15: Three Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
June 15, 1966	322.0	324.3	320.3	322.2
16	321.1	323.2	320.4	322.3
17	321.0	323.1	320.4	322.3
18	320.7	322.7	320.3	322.2
19	320.3	322.2	320.1	322.0
20	320.1	322.0	320.0	321.9
21	320.3	322.2	320.1	322.0
22	319.9	321.7	319.8	321.6
23	319.6	321.4	319.6	321.4
24	318.5	320.0	319.1	320.8
25	318.6	320.1	319.4	321.1
26	318.5	320.0	319.2	320.9
27	319.0	320.6	319.3	321.0
28	318.7	320.3	318.7	320.3
29	318.1	319.5	318.7	320.3
30	317.6	318.9	318.1	319.5
July 1, 1966	317.1	318.3	317.9	319.3
2	317.0	318.2	317.8	319.2
3	317.2	318.4	318.2	319.7

Table 15: Three Lay Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
July 4, 1966	317.2	318.4	318.4	319.9
5	316.8	318.0	318.4	319.9
6	316.1	317.1	318.3	319.8
7	315.5	316.4	318.0	315.4
8	314.4	315.0	317.0	318.2
9	313.5	313.9	315.8	316.7
10	313.6	314.1	315.5	316.4
11	313.5	313.9	315.1	315.3
12	313.1	313.4	315.0	315.8
13	312.9	313.2	314.1	314.7
14	312.8	313.1	313.8	314.3
15	313.0	313.3	313.1	313.4
16	312.1	312.2	312.6	312.6
17	311.7	311.7	312.0	312.8
18	311.8	311.9	313.4	313.8
19	311.4	311.4	313.8	314.3
20	312.1	312.2	313.5	313.9
21	311.6	311.6	312.3	312.5
22	311.5	311.5	312.5	312.7
23	311.2	311.1	312.9	313.2

Table 15: Three Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
July 24, 1966	311.6	311.6	313.7	314.2
25	312.7	313.0	313.7	314.2
26	313.2	313.6	313.8	314.3
27	313.6	314.1	314.1	314.7
28	313.7	314.2	314.2	314.8
29	313.6	314.1	313.9	314.4
30	313.3	313.7	313.5	313.9
31	312.4	312.6	312.4	312.6
August 1, 1966	311.8	311.9	312.0	312.1
2	311.4	311.4	311.7	311.7
3	-----	-----	312.1	312.2
4	-----	-----	312.1	312.2
5	-----	-----	311.7	311.7
6	-----	-----	311.5	311.5
7	-----	-----	311.5	311.5
8	312.7	313.0	311.7	311.7
9	312.6	312.8	311.7	311.7
10	312.6	312.8	311.6	311.6
11	312.5	312.7	311.3	311.2
12	312.4	312.6	311.2	311.1

Table 15: Three Day Running Mean Concentration  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
August 13, 1966				
14	312.5	312.7	311.1	311.0
15	312.5	312.7	311.1	311.0
16	312.1	312.2	310.8	310.6
17	311.6	311.6	310.6	310.4
18	311.2	311.1	310.3	310.0
19	311.2	311.1	310.3	310.0
20	311.0	310.9	310.2	309.9
21	310.9	310.8	310.4	310.2
22	311.2	311.1	310.8	310.6
23	311.4	311.4	311.0	310.9
24	312.2	312.3	311.0	310.9
25	311.9	312.0	310.9	310.8
26	312.7	313.0	310.9	310.8
27	312.3	312.5	311.2	311.1
28	313.6	314.1	311.3	311.2
29	312.6	312.8	311.1	311.0
30	311.7	311.7	310.5	310.3
31	310.2	309.9	310.1	309.8
	310.2	309.9	310.2	309.9

Table 15: Three Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
September 1, 1966	310.2	309.9	310.3	310.0
2	310.0	309.7	310.2	309.9
3	309.9	309.5	310.1	309.8
4	309.7	309.3	309.9	309.5
5	310.2	309.9	310.2	309.3
6	310.4	310.2	310.7	310.5
7	310.4	310.2	310.7	310.5
8	310.7	310.5	310.9	310.8
9	310.5	310.3	310.5	310.3
10	310.6	310.4	310.8	310.6

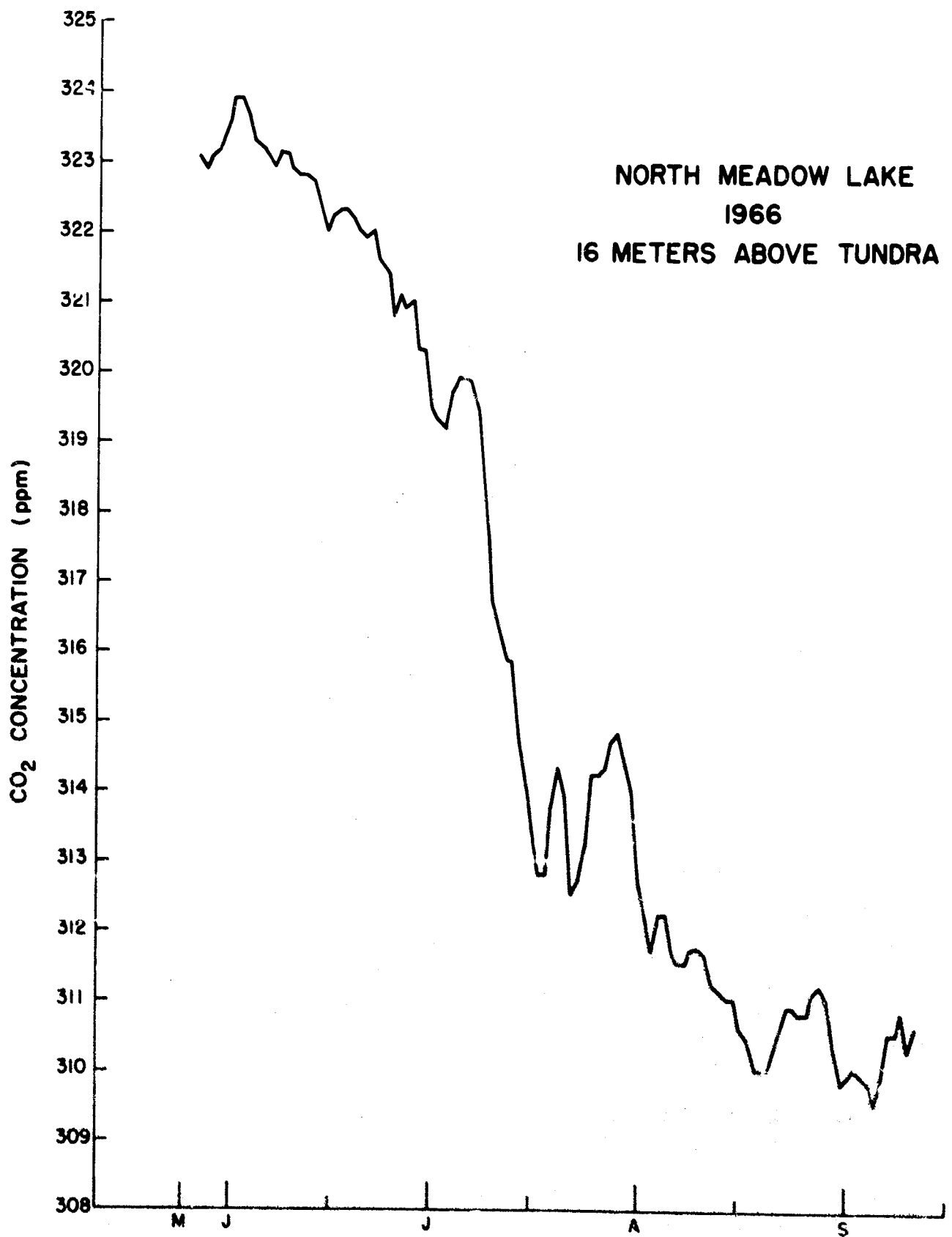


Figure 11. Three Day Running Mean of CO<sub>2</sub> Concentration at 16 m.  
North Meadow Lake, 1966.



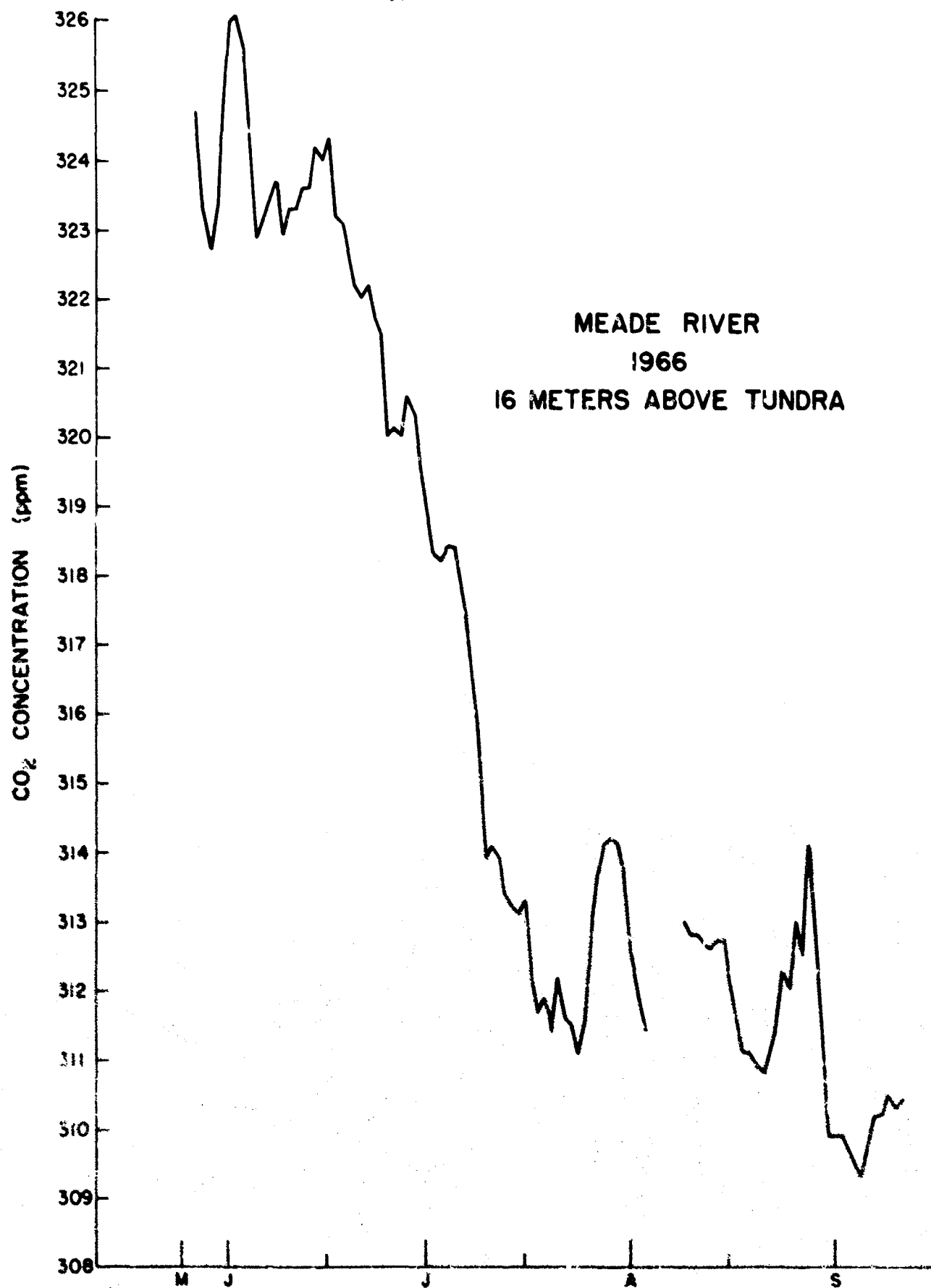


Figure 12. Three Day Running Mean of CO<sub>2</sub> concentrations at 16 m, Meade River, 1966.

Table 16: Six Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration		
	Meade River Index	Manometric(ppm)	North Meadow Lake Index Manometric(ppm)
May 23, 1966	321.7	323.9	321.1 323.2
30	321.8	324.0	321.1 323.2
31	322.0	324.3	321.3 323.4
June 1, 1966	322.4	324.8	321.4 323.6
2	322.7	325.1	321.4 323.6
3	322.5	324.9	321.4 323.6
4	322.2	324.5	321.4 323.6
5	322.1	324.4	321.3 323.4
6	321.4	323.6	321.1 323.2
7	321.2	323.3	321.0 323.1
8	321.0	323.1	321.0 323.1
9	321.3	323.4	320.9 322.9
10	321.3	323.4	320.9 322.9
11	321.1	323.2	320.9 322.9
12	321.3	323.4	320.9 322.9
13	321.5	323.7	320.8 322.8
14	321.6	323.8	320.6 322.6
15	321.6	323.8	320.4 322.3
16	321.6	323.8	320.4 322.3

Table 16: Six Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
June 17, 1966	321.5	323.7	320.3	322.2
18	321.2	323.3	320.3	322.2
19	320.6	322.5	320.5	322.2
20	320.5	322.5	320.2	322.1
21	320.5	322.5	320.2	322.1
22	320.1	322.0	319.9	321.7
23	319.8	321.5	319.8	321.6
24	319.4	321.1	319.6	321.4
25	319.2	320.5	319.6	321.4
26	319.0	320.6	319.4	321.1
27	318.7	320.3	319.2	320.9
28	318.7	320.3	319.0	320.6
29	318.3	319.8	318.9	320.5
30	318.3	319.8	318.7	320.3
July 1, 1966	317.9	319.3	318.3	319.8
2	317.6	318.9	318.2	319.7
3	317.4	318.7	318.1	319.5
4	317.1	318.3	318.1	319.5
5	316.9	318.1	318.1	319.5

Table 16: Six Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration		North Meadow Lake	
	Meade River		Index	Manometric(ppm)
July 6, 1966	Index	Manometric(ppm)		
7	316.6	317.7	318.2	319.7
8	316.3	317.3	318.2	319.7
9	315.6	316.5	317.7	319.0
10	314.8	315.5	317.0	318.2
11	314.5	315.1	316.7	317.8
12	314.0	314.5	316.0	317.0
13	313.3	313.7	315.4	316.2
14	313.2	313.6	314.8	315.5
15	313.1	313.4	314.4	315.0
16	313.0	313.3	314.0	314.5
17	312.5	312.7	313.4	313.8
18	312.2	312.3	313.2	313.6
19	312.4	312.6	313.2	313.6
20	311.8	311.9	313.2	313.6
21	311.9	312.0	313.0	313.3
22	311.7	311.7	312.8	313.1
23	311.4	311.4	313.1	313.4
24	311.7	311.7	313.2	313.6
25	311.6	311.6	313.0	313.3
	312.1	312.2	313.1	313.4

Table 16: Six Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
July 26, 1966	312.2	312.3	313.4	313.8
27	312.6	312.8	313.9	314.4
28	313.2	313.6	313.9	314.4
29	313.4	313.8	313.9	314.4
30	313.4	313.8	313.8	314.3
31	313.1	313.4	313.3	313.7
August 1, 1966	312.7	313.0	312.9	313.2
2	-----	-----	312.6	312.8
3	-----	-----	312.3	312.5
4	-----	-----	312.0	312.1
5	-----	-----	311.7	311.7
6	-----	-----	311.8	311.9
7	-----	-----	311.8	311.9
8	-----	-----	311.7	311.7
9	-----	-----	311.6	311.6
10	-----	-----	311.6	311.6
11	-----	-----	311.5	311.5
12	-----	-----	311.5	311.5
13	312.5	312.7	311.4	311.4

Table 16: Six Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
August 14, 1966	312.5	312.7	311.2	311.1
15	312.3	312.5	311.0	310.9
16	312.0	312.1	310.9	310.8
17	311.8	311.9	310.7	310.5
18	311.6	311.6	310.6	310.4
19	311.3	311.2	310.4	310.2
20	311.0	310.9	310.4	310.2
21	311.2	311.1	310.5	310.3
22	311.2	311.1	310.6	310.4
23	311.6	311.6	310.7	310.5
24	311.5	311.5	310.8	310.6
25	312.0	312.1	310.9	310.8
26	312.3	312.5	311.1	311.0
27	312.7	313.0	311.1	311.0
28	312.6	312.8	311.0	310.9
29	312.0	312.1	310.8	310.6
30	311.9	312.0	310.7	310.5
31	311.4	311.4	310.6	310.4
September 1, 1966	311.0	310.9	310.4	310.2

Table 16: Six Day Running Mean Concentration of  
Atmospheric Carbon Dioxide

16 meters

Date	CO <sub>2</sub> Concentration			
	Meade River		North Meadow Lake	
	Index	Manometric(ppm)	Index	Manometric(ppm)
September 2, 1966				
3	310.1	309.8	310.2	309.9
4	310.0	309.7	310.2	309.9
5	310.0	309.7	310.1	309.8
6	310.1	309.8	310.2	309.9
7	310.1	309.8	310.4	310.2
8	310.1	309.8	310.3	310.0
9	310.5	310.3	310.5	310.3
10	310.4	310.2	310.6	310.4
	310.5	310.3	310.8	310.6

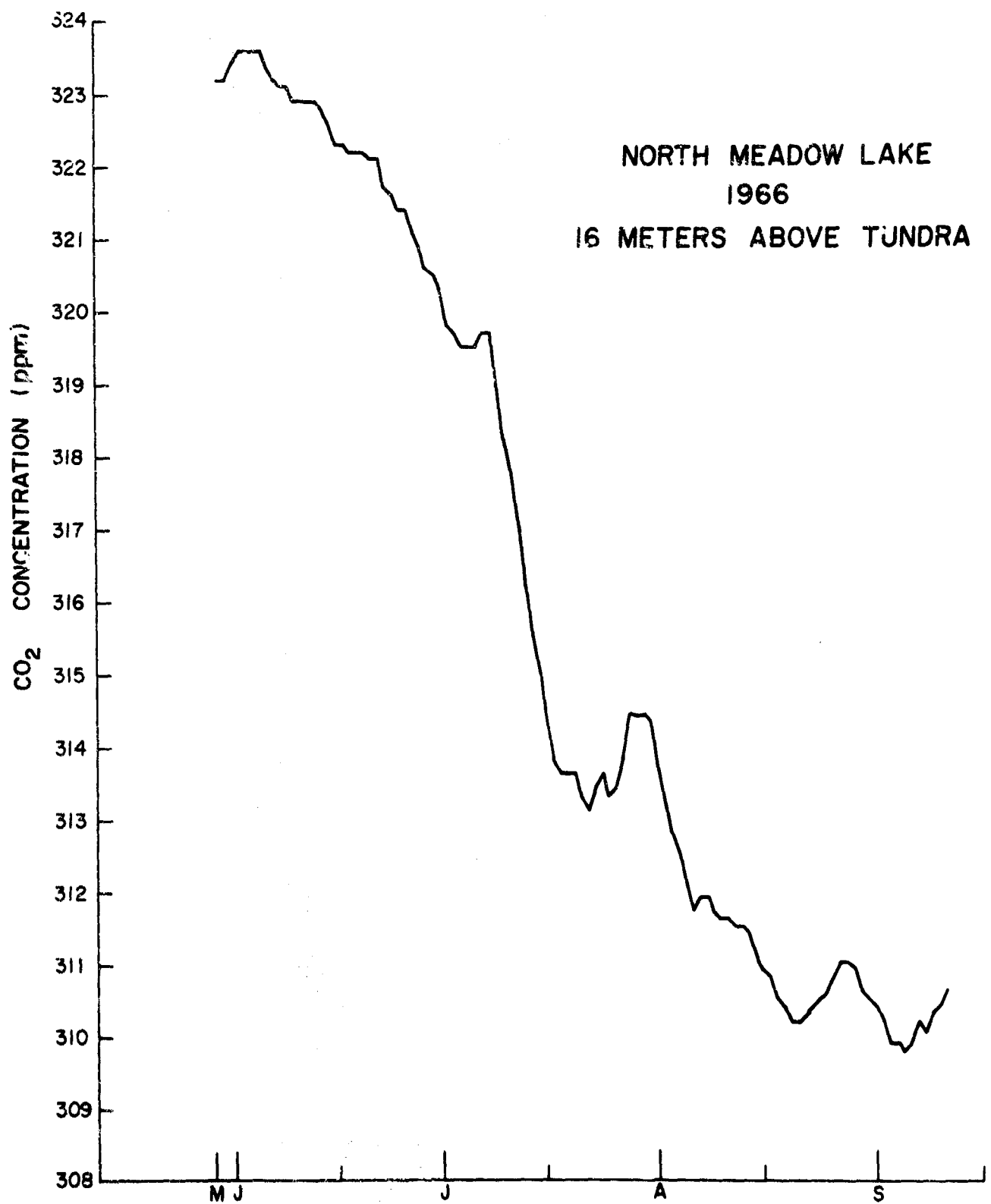


Figure 13. Six Day Running Mean CO<sub>2</sub> Concentration at 16 m, North Meadow Lake, 1966.



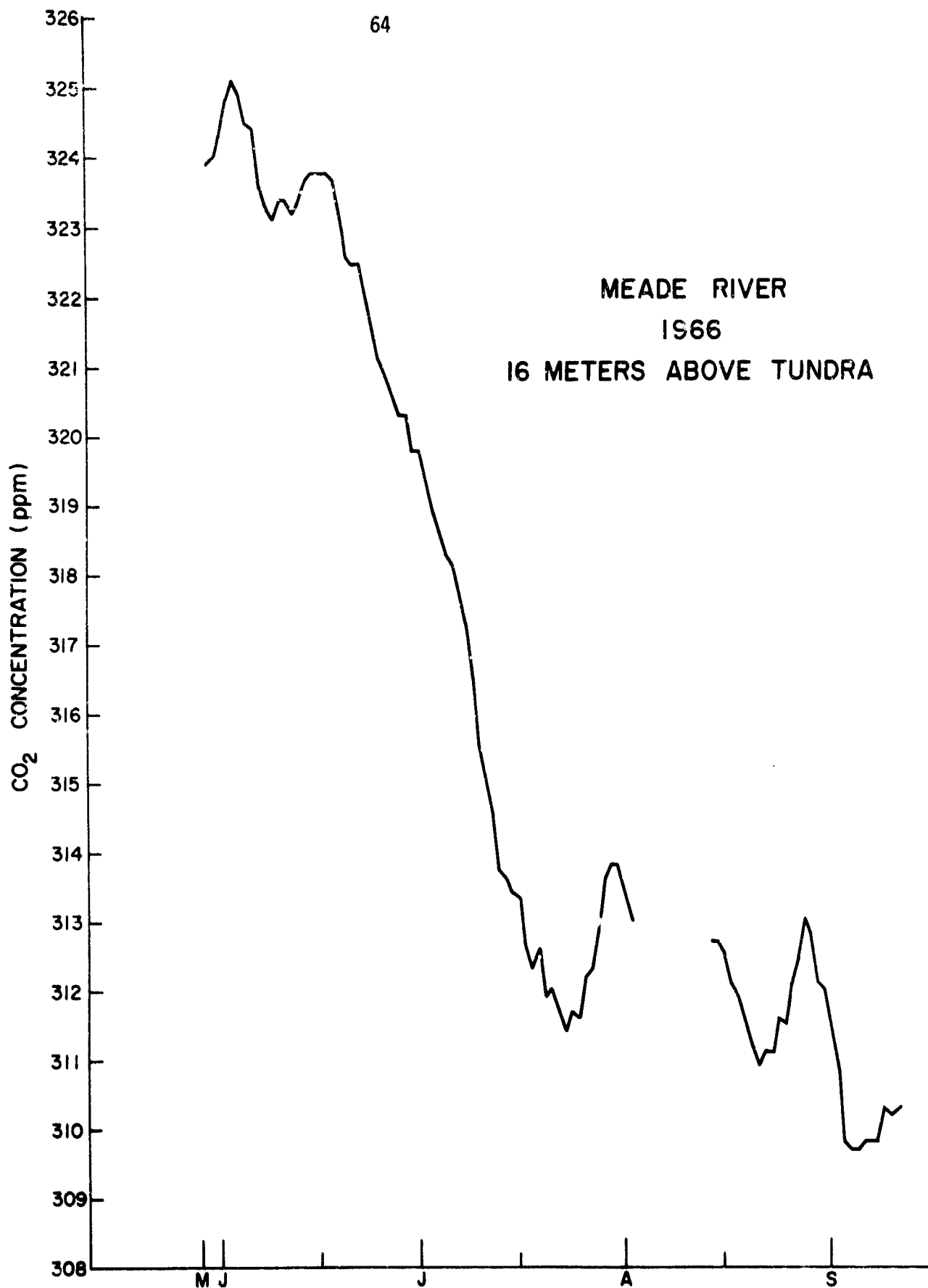


Figure 14. Six Day Running Mean CO<sub>2</sub> Concentration at 16 m, Meade River, 1966.

Table 17: Diurnal Course of Carbon Dioxide  
Meade River, Alaska

A.S.T.	Index June	Index July	16 meters	
			Index August	
1966				
00-01	319.4	314.1	312.2	
01-02	319.4	314.3	312.5	
02-03	319.9	314.5	312.7	
03-04	320.0	314.6	312.5	
04-05	320.0	314.7	312.7	
05-06	319.8	314.7	312.6	
06-07	319.2	314.3	312.3	
07-08	319.5	313.9	312.0	
08-09	319.8	313.8	311.7	
09-10	319.7	313.0	311.7	
10-11	320.5	312.8	311.6	
11-12	321.0	312.4	311.5	
12-13	320.8	312.7	311.5	
13-14	320.9	312.5	311.7	
14-15	320.6	312.8	311.5	
15-16	320.7	312.7	311.2	
16-17	320.0	312.9	310.8	
17-18	319.9	312.9	311.0	
18-19	319.4	312.9	310.9	
19-20	319.6	312.5	311.0	

Table 17: Diurnal Course of Carbon Dioxide  
Heade River, Alaska 16 meters

<u>A.S.T.</u>	<u>Index June</u>	<u>Index July</u>	<u>Index August</u>
1966			
20-21	319.4	312.3	311.2
21-22	319.3	312.6	311.4
22-23	319.4	312.9	311.6
23-24	319.2	313.3	311.8

MEADE RIVER  
1966  
16 METERS ABOVE TUNDRA

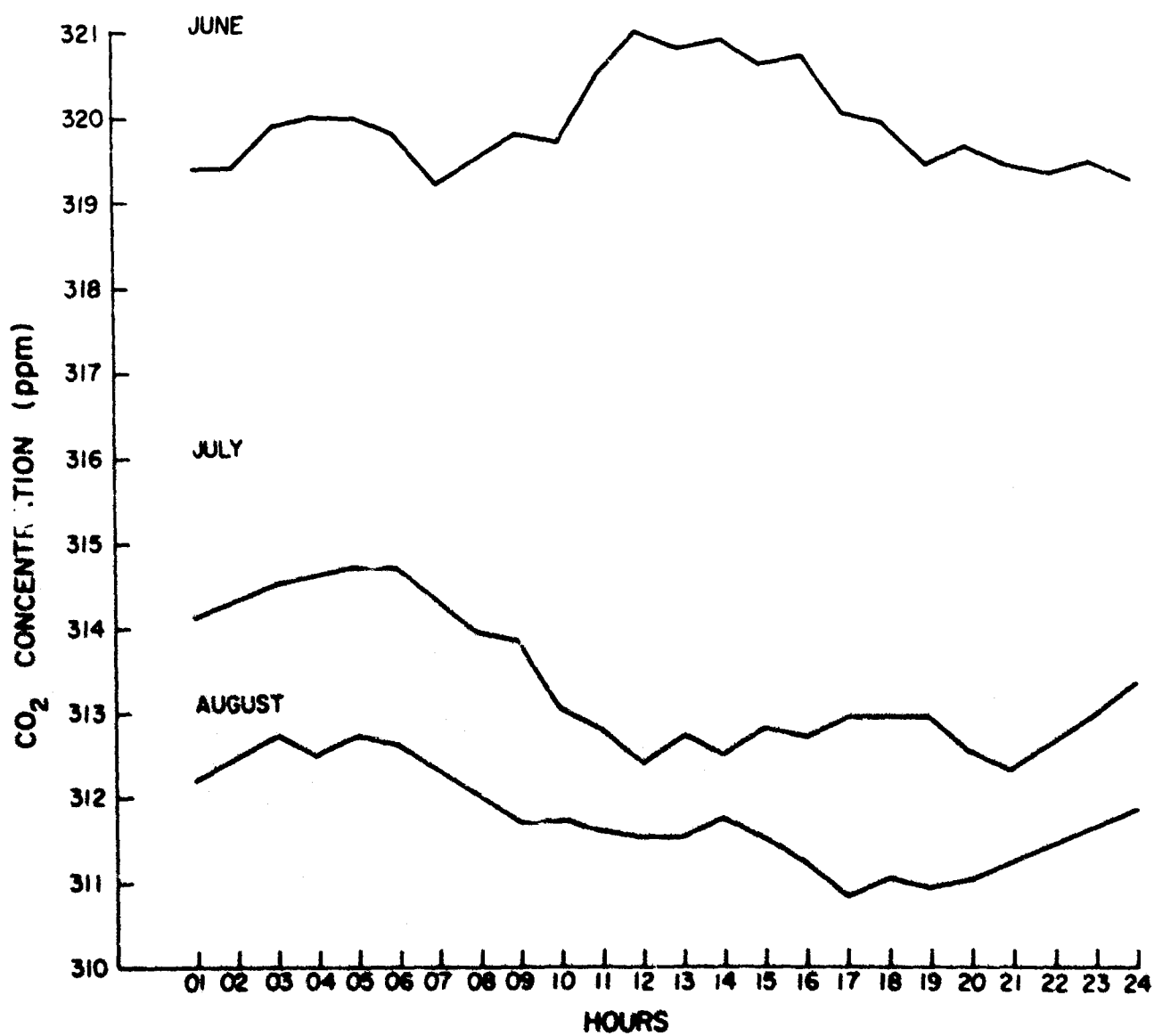


Figure 15. Diurnal Variation of CO<sub>2</sub> at 16 m, Meade River, 1966.

Table 18: Diurnal Course of Carbon Dioxide  
North Meadow Lake, Alaska

16 meters

<u>A.S.T.</u>	<u>Index June</u>	<u>Index July</u>	<u>Index August</u>
1966			
00-01	322.2	315.3	311.4
01-02	320.5	315.2	311.5
02-03	320.4	315.0	311.4
03-04	320.2	314.8	311.2
04-05	320.2	314.7	311.1
05-06	320.1	314.6	311.0
06-07	320.1	314.4	310.9
07-08	320.0	314.4	311.0
08-09	320.0	314.3	311.0
09-10	320.0	314.2	311.0
10-11	320.0	314.2	310.8
11-12	320.0	314.2	310.9
12-13	320.0	314.1	310.9
13-14	319.9	314.1	310.9
14-15	319.8	314.1	310.8
15-16	319.9	314.2	310.9
16-17	319.8	314.1	310.8
17-18	319.8	314.3	310.8
18-19	319.8	314.5	310.8
19-20	319.7	314.8	311.0

Table 16: Diurnal Course of Carbon Dioxide  
North Meadow Lake, Alaska

16 meters

<u>A.S.T.</u>	<u>Index June</u>	<u>Index July</u>	<u>Index August</u>
1966			
20-21	319.9	314.9	311.1
21-22	320.0	315.1	311.4
22-23	320.3	315.2	311.5
23-24	320.2	315.1	311.5

NORTH MEADOW LAKE  
1966  
16 METERS ABOVE TUNDRA

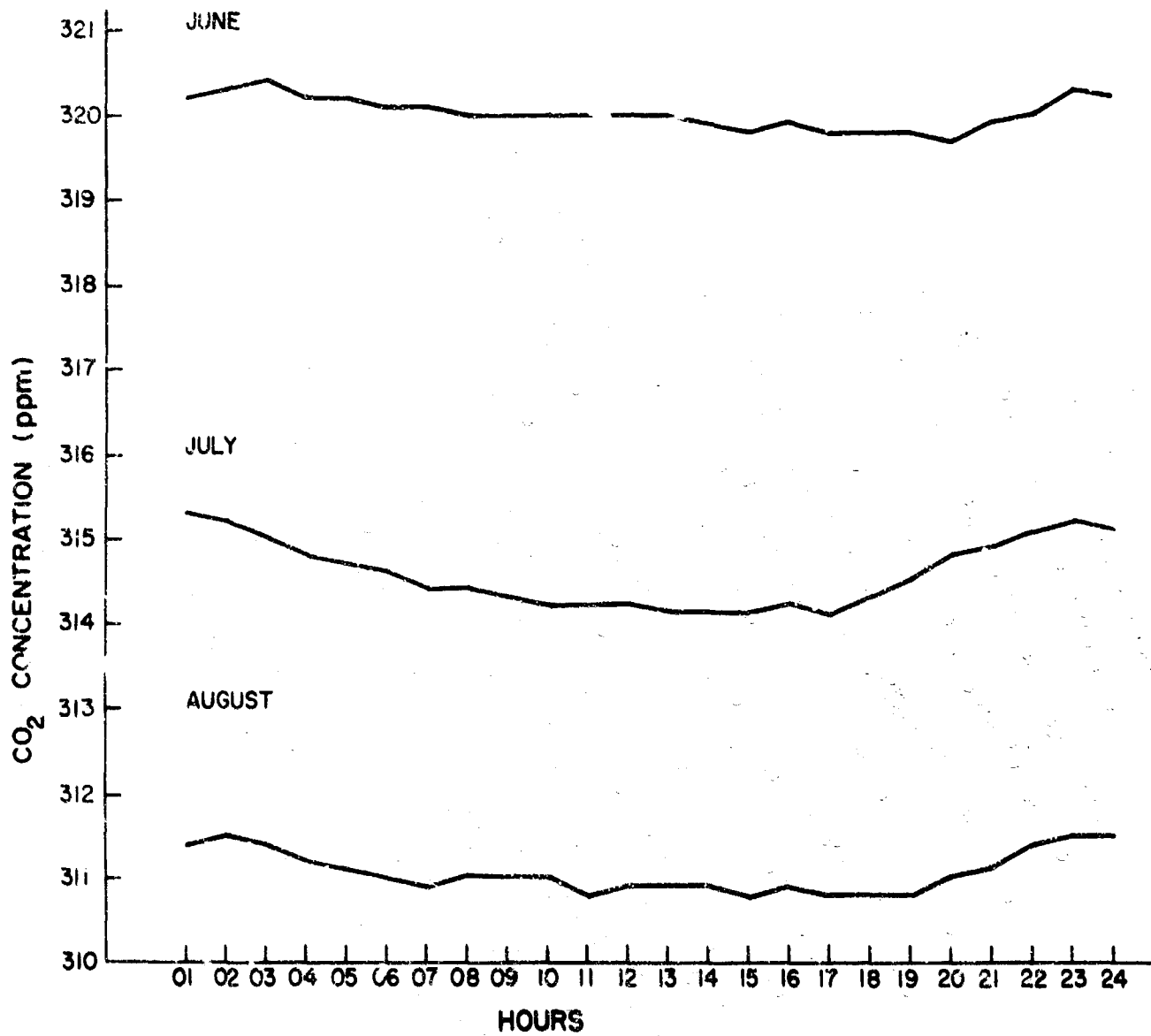


Figure 16. Diurnal Variation of CO<sub>2</sub> at 16 m, North Meadow Lake, 1966.

Table 19: Three Month Average Diurnal Course of Carbon Dioxide  
for June, July and August, 1966 16 meters

A.S.T.	North Meadow Lake Index	Meade River Index
00-01	315.6	315.2
01-02	315.7	315.4
02-03	315.6	315.7
03-04	315.4	315.7
04-05	315.3	315.8
05-06	315.2	315.7
06-07	315.1	315.3
07-08	315.1	315.1
08-09	315.1	315.1
09-10	315.1	314.8
10-11	315.0	315.0
11-12	315.0	315.0
12-13	315.0	315.0
13-14	315.0	315.0
14-15	314.9	315.0
15-16	315.0	315.0
16-17	314.9	314.9
17-18	315.0	314.6
18-19	315.0	314.6
19-20	315.2	314.4
20-21	315.3	314.3



Table 19: Three Month Average Diurnal Course of Carbon Dioxide  
for June, July and August, 1966  
16 meters

<u>A.S.T.</u>	<u>North Meadow Lake Index</u>	<u>Meade River Index</u>
21-22	315.5	314.4
22-23	315.7	314.6
23-24	315.6	314.8

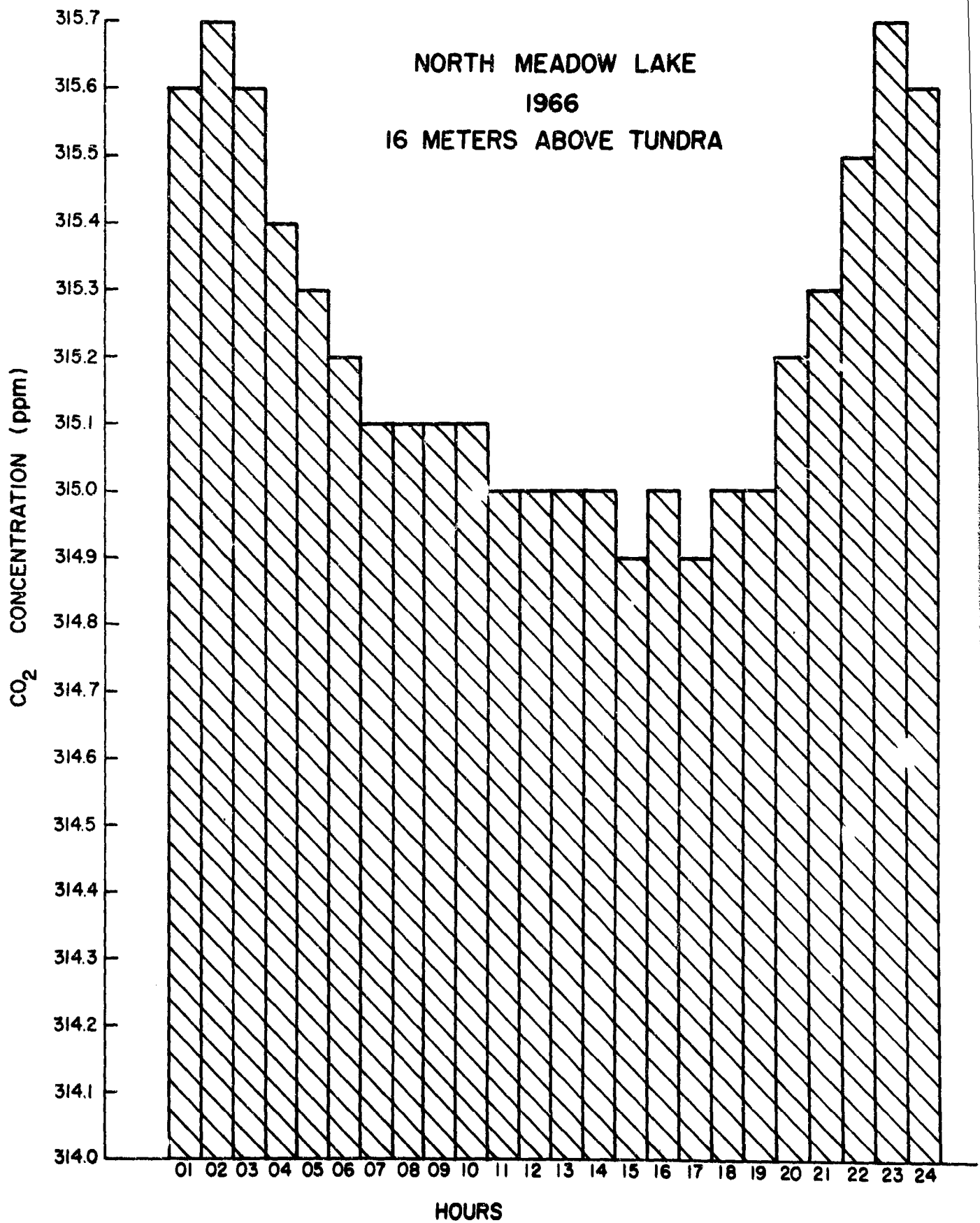


Figure 17. Three Month Duirnal Variation of CO<sub>2</sub>, June, July, August, at 16 m, North Meadow Lake, 1966.

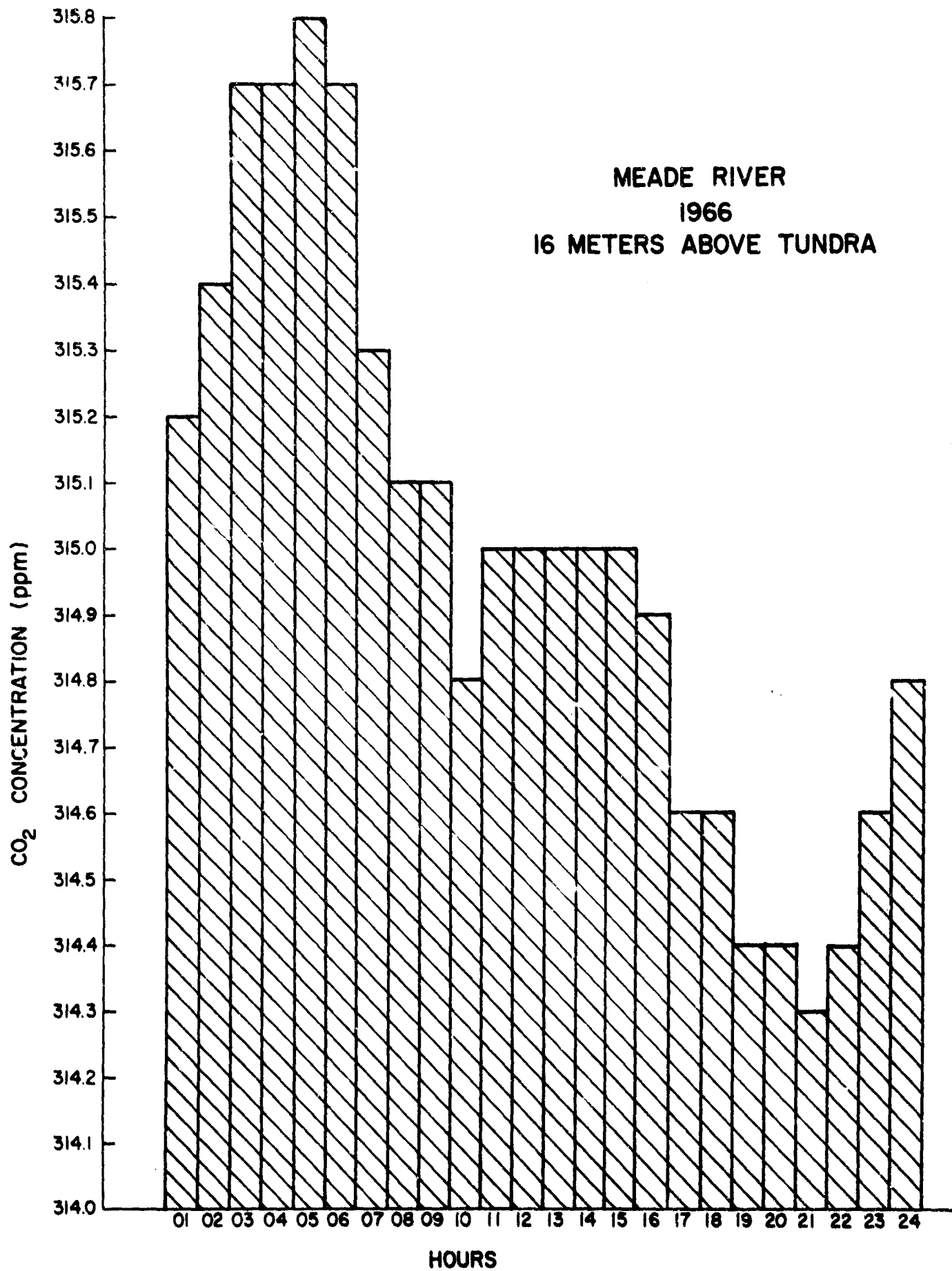


Figure 18. Three Month Diurnal Variation of CO<sub>2</sub>, June, July, August,  
at 16 m, Meade River, 1966

Table 20: Carbon Dioxide Difference Between Ground and 16 Meter Level

Average Daily CO<sub>2</sub> Concentration  
Meade River

+ means from ground to air  
- means from air to ground

Date 1966	Manometric Scale CO <sub>2</sub> Conc.		Date 1966	CO <sub>2</sub> Conc.		ACO <sub>2</sub>
	Ground	16m		Ground	16m	
May 24	325.8	- 325.4	June 14	324.9	- 323.2	+1.7
25	325.4	- 325.4	15	-----	-----	-----
26	323.2	- 323.2	16	325.5	- 323.2	+2.3
27	322.7	- 321.5	17	323.9	- 322.9	+1.0
28	324.1	- 323.4	18	322.5	- 321.9	+0.6
29	325.2	- 325.0	19	322.7	- 322.0	+0.7
30	327.3	- 325.9	20	322.5	- 322.0	+0.5
31	327.7	- 327.1	21	323.4	- 322.6	+0.8
			22	323.3	- 320.4	+2.9
June 1	325.8	- 325.5	23	321.1	- 321.0	+0.1
2	325.0	- 324.2	24	319.9	- 318.8	+1.1
3	322.2	- 321.7	25	321.5	- 320.6	+0.9
4	324.5	- 322.9	26	321.3	- 320.8	+0.5
5	326.0	- 325.0	27	321.3	- 320.4	+0.9
6	322.7	- 322.3	28	324.3	- 319.8	+4.5
7	323.6	- 323.8	29	319.2	- 318.4	+0.8
8	323.0	- 322.8	30	319.5	- 318.6	+0.9
9	323.4	- 323.4				
10	324.4	- 323.6	July 1	317.8	- 318.0	-0.2
11	324.5	- 323.6	2	318.6	- 318.2	+0.4
12	325.2	- 323.4	3	318.4	- 319.0	-0.6
13	326.5	- 325.4	4	318.1	- 318.1	0

Table 20: Carbon Dioxide Difference Between Ground and 16 Meter Level  
 + means from ground to air  
 - means from air to ground  
 Average Daily CO<sub>2</sub> Concentration  
 Meade River

Date 1966	Manometric Scale CO <sub>2</sub> Conc.		Date 1966	CO <sub>2</sub> Conc.		ΔCO <sub>2</sub>
	Ground	16m		Ground	16m	
July 5	316.6	- 316.7	July 27	314.3	- 314.2	+0.1
6	317.2	- 316.6	28	315.0	- 314.5	+0.5
7	315.0	- 315.8	29	314.3	- 313.6	+0.7
8	313.5	- 312.8	30	312.4	- 312.8	-0.4
9	313.3	- 313.3	31	313.2	- 311.4	+1.8
10	315.3	- 315.9				
11	312.2	- 312.7	August 1	314.1	- 311.4	+2.7
12	312.6	- 311.9	2	-----	-----	-----
13	316.0	- 315.1	3	-----	-----	-----
14	311.9	- 312.1	4	-----	-----	-----
15	311.6	- 312.6	5	-----	-----	-----
16	312.8	- 312.1	6	-----	-----	-----
17	310.3	- 310.5	7	-----	-----	-----
18	313.3	- 312.8	8	314.2	- 313.0	+1.2
19	313.1	- 310.8	9	313.0	- 312.7	+0.3
20	314.7	- 313.1	10	313.3	- 312.7	+0.6
21	310.8	- 311.0	11	312.8	- 312.6	+0.2
22	309.6	- 310.3	12	313.1	- 312.6	+0.5
23	313.0	- 312.2	13	313.5	- 312.8	+0.7
24	310.2	- 312.5	14	319.4	- 312.7	+6.7
25	313.6	- 314.2	15	313.2	- 311.1	+2.1
26	314.3	- 313.9	16	311.7	- 310.9	+0.8

Table 20: Carbon Dioxide Difference Between Ground and 16 Meter Level

Average Daily CO <sub>2</sub> Concentration Meade River				+ means from ground to air - means from air to ground				
Manometric Scale		CO <sub>2</sub> Conc.		Date 1966	CO <sub>2</sub> Conc.		ΔCO <sub>2</sub>	
Date 1966	Ground	16m	Ground		16m			
August	17	312.5 - 311.4		September 7	311.1 - 309.2		+1.9	
	18	312.2 - 311.0		8	313.3 - 312.2		+1.1	
	19	311.1 - 310.3		9	310.5 - 309.4		+1.1	
	20	312.5 - 311.0		10	310.6 - 309.7		+0.9	
	21	315.5 - 312.0						
	22	319.5 - 311.2						
	23	320.5 - 313.9						
	24	312.8 - 310.8						
	25	315.9 - 314.1						
	26	314.9 - 312.7						
	27	321.4 - 315.4						
	28	311.6 - 310.4						
	29	310.2 - 309.5						
	30	310.9 - 309.9						
	31	310.9 - 310.2						
	September	1	310.3 - 309.7					
		2	309.8 - 309.3					
		3	310.0 - 309.5					
		4	313.2 - 309.2					
		5	320.0 - 311.1					
6		311.9 - 310.2						

Table 20: Carbon Dioxide Difference Between Ground and 16 Meter Level

Average Daily CO<sub>2</sub> Concentration  
North Meadow Lake

+ means CO<sub>2</sub> from ground to air  
- means CO<sub>2</sub> from air to ground

Date 1966	Manometric Scale CO <sub>2</sub> Conc.		Date 1966	CO <sub>2</sub> Conc.		$\Delta$ CO <sub>2</sub>
	Ground	16m		Ground	16m	
May 24	333.1	- 323.4	June 14	323.6	- 322.0	+ 1.6
25	345.7	- 322.9	15	325.6	- 322.5	+ 3.1
26	346.6	- 322.9	16	323.2	- 322.5	+ 0.7
27	344.3	- 323.1	17	322.1	- 322.1	0
28	349.1	- 323.2	18	-----	-----	-----
29	348.8	- 323.4	19	365.2	- 321.9	+43.3
30	351.6	- 323.8	20	338.9	- 321.9	+17.0
31	348.1	- 324.4	21	332.8	- 322.2	+10.6
			22	321.7	- 320.8	+ 0.9
June 1	339.8	- 323.4	23	342.9	- 321.1	+21.8
2	338.7	- 323.3	24	343.7	- 320.4	+23.3
3	374.3	- 323.3	25	322.2	- 321.7	+ 0.5
4	423.4	- 322.8	26	320.4	- 320.4	0
5	-----	-----	27	321.7	- 321.0	+ 0.7
6	378.9	- 323.1	28	320.3	- 319.5	+ 0.8
7	355.8	- 323.1	29	321.2	- 320.3	+ 0.9
8	387.2	- 322.9	30	319.7	- 318.8	+ 0.9
9	389.0	- 322.9				
10	399.7	- 322.7	July 1	318.6	- 318.7	- 0.1
11	-----	-----	2	320.0	- 320.0	0
12	-----	-----	3	320.1	- 320.1	0
13	-----	-----	4	319.7	- 319.7	0

Table 20: Carbon Dioxide Difference Between Ground and 16 Meter Level

Average Daily CO<sub>2</sub> Concentration  
North Meadow Lake

+ means CO<sub>2</sub> from ground to air  
- means CO<sub>2</sub> from air to ground

Date 1966	Manometric Scale CO <sub>2</sub> Conc.		Date 1966	CO <sub>2</sub> Conc.		$\Delta$ CO <sub>2</sub>
	Ground	16m		Ground	16m	
July 5	320.0	- 320.0	July 27	313.9	- 314.8	-0.9
6	321.5	- 319.8	28	314.4	- 314.8	-0.4
7	321.7	- 318.3	29	313.8	- 313.8	0
8	317.0	- 316.6	30	313.2	- 313.3	-0.1
9	314.7	- 315.1	31	310.9	- 310.8	+0.1
10	317.3	- 317.3				
11	315.1	- 315.0	August 1	311.5	- 312.1	-0.6
12	314.5	- 314.8	2	312.2	- 312.5	-0.3
13	314.1	- 314.3	3	311.7	- 312.2	-0.5
14	312.4	- 313.8	4	311.2	- 311.9	-0.7
15	311.2	- 312.1	5	310.6	- 311.2	-0.6
16	312.3	- 312.6	6	311.0	- 311.5	-0.5
17	313.1	- 313.7	7	311.4	- 311.7	-0.3
18	314.4	- 315.1	8	312.1	- 312.1	0
19	315.8	- 313.9	9	310.6	- 311.4	-0.8
20	314.2	- 312.7	10	311.2	- 311.5	-0.3
21	310.0	- 310.8	11	310.9	- 311.0	-0.1
22	314.2	- 314.7	12	310.9	- 311.0	-0.1
23	314.4	- 314.3	13	311.1	- 311.0	+0.1
24	312.6	- 313.7	14	311.1	- 311.0	+0.1
25	310.6	- 314.5	15	310.0	- 309.9	+0.1
26	313.9	- 314.7	16	310.2	- 310.3	-0.1



Table 20: Carbon Dioxide Difference Between Ground and 16 Meter Level

+ means CO<sub>2</sub> from ground to air  
 - means CO<sub>2</sub> from air to ground

Average Daily CO<sub>2</sub> Concentration  
 North Meadow Lake

Date 1966	Manometric Scale CO <sub>2</sub> Conc.		Date 1966	ΔCO <sub>2</sub>	CO <sub>2</sub> Conc.	
	Ground	16m			Ground	16m
August 17	310.0	- 309.9	September 7	+0.1	309.9	- 309.4
18	309.8	- 309.9	8	-0.1	311.7	- 311.2
19	310.0	- 310.0	9	0	310.4	- 310.0
20	311.2	- 310.5	10	+0.7	310.9	- 310.8
21	313.0	- 311.2		+1.8		
22	311.6	- 310.8		+0.8		
23	311.2	- 310.8		+0.4		
24	311.5	- 310.6		+0.9		
25	314.9	- 310.8		+4.1		
26	313.8	- 312.0		+1.8		
27	311.9	- 311.1		+0.8		
28	310.0	- 309.8		+0.2		
29	310.2	- 309.8		+0.4		
30	310.3	- 309.9		+0.4		
31	310.3	- 310.0		+0.3		
September 1	310.0	- 310.0		0		
2	309.8	- 309.7		+0.1		
3	309.8	- 309.8		0		
4	310.0	- 309.3		+0.7		
5	315.6	- 310.8		+4.8		
6	313.3	- 311.5		+1.8		

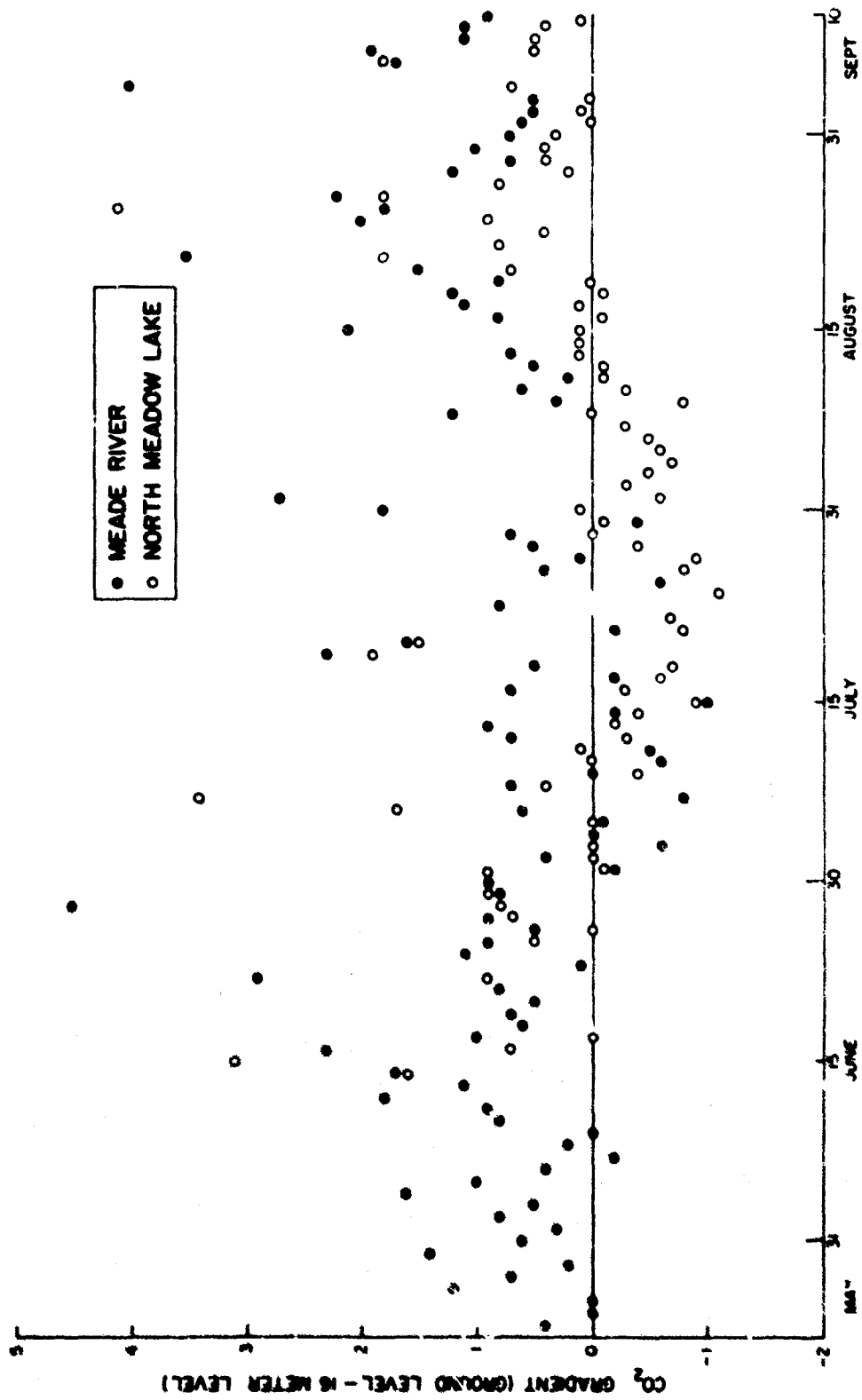


Figure 19. Average Daily  $\text{CO}_2$  Gradient Between 16 m and 1 cm at Meade River and North Meadow Lake.

### III ECOLOGICAL OBSERVATIONS

Results of measurements of biotic and abiotic parameters are presented in the following section. Discussion of methods of analysis and plant taxonomy has been published in several journal contributions (1, 2, 3, 7) previously listed.

Net primary production above ground was harvested each month from 2 x 5 dm plots in the five predominant communities (Figures 34-39). The litter and non-functional plant materials were separated from the chlorophyllous tissue and both components were oven dried at 70° C and weighed. Growth rates of five common species were determined from weekly measurements of stem and inflorescence length on the same 140 plants throughout the summer. For purposes of comparison the data are expressed as percentages of maximum growth. Six day running means of carbon dioxide concentration were compared with percent maximum growth, measured weekly and are shown in Figure 40. Dry matter production in the Arctic ecosystem at Meade River, Alaska is shown in Figure 30. Histograms of chlorophyll distribution in four communities is given in Figure 41. Tables 25 through 33 tabulate information on growth rate, chlorophyll, and dry weight production.

Hourly carbon dioxide concentrations and air temperatures at Meade River for various periods during the growing season are shown in Figures 21-25. The shaded area between the 16 cm and 1 cm curves represents the time and intensity of a positive flux due to photosynthesis at Meade River.

Results of meteorological observations are given in Tables 21, 22, and 23 and Figures 26, 27, 28, and 29. Some chemical analyses of Meade River water samples are given in Table 24.

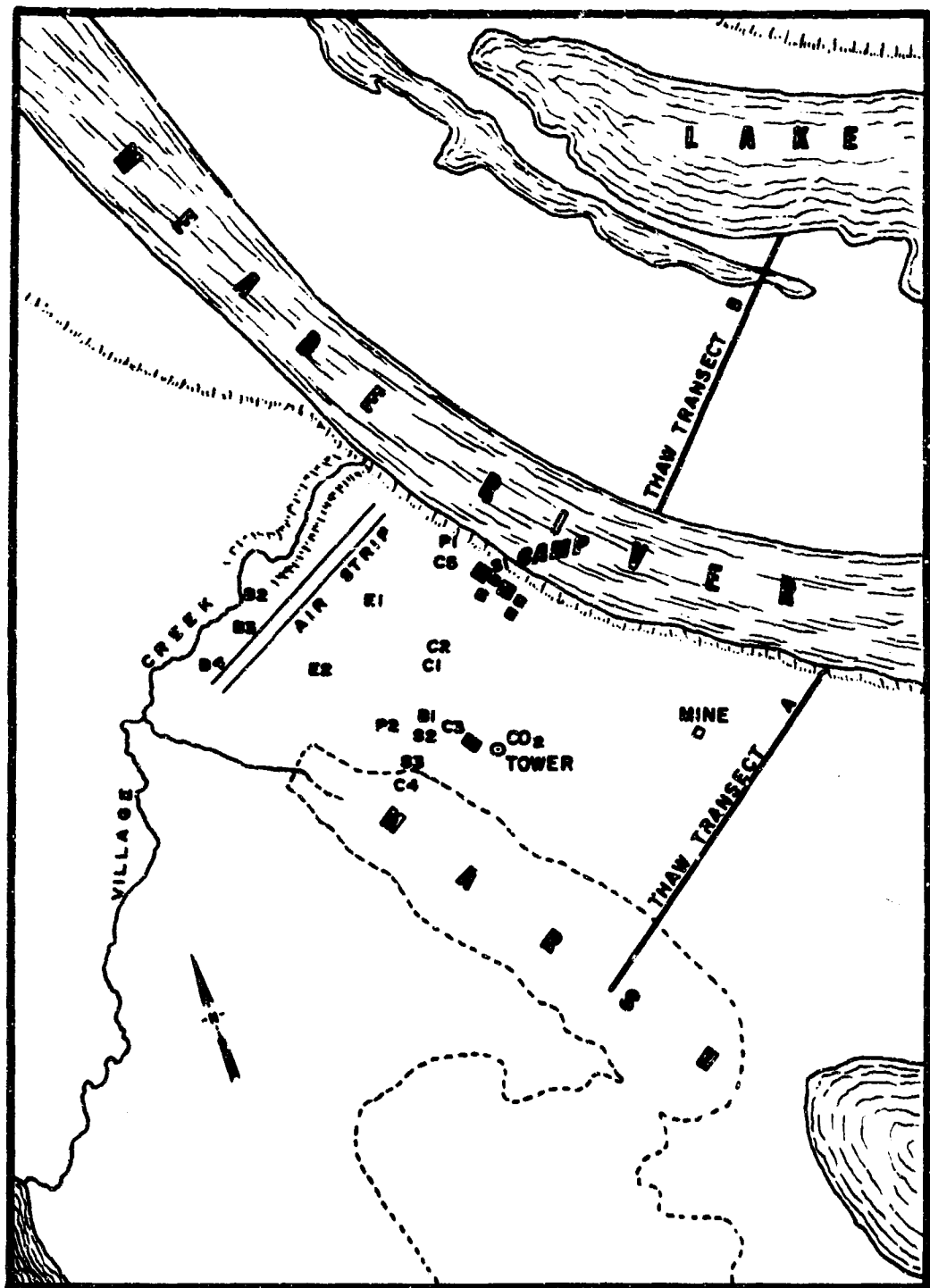


Figure 20. Meade River Study Site Showing Positions of Camp Buildings, Coal Mine, Carbon Dioxide Tower, Transects for Weekly Monitoring of Thaw Depth, and Plant Growth: B = Betula, C = Carex, E = Eriophorum, P = Polygonum and S = Salex.

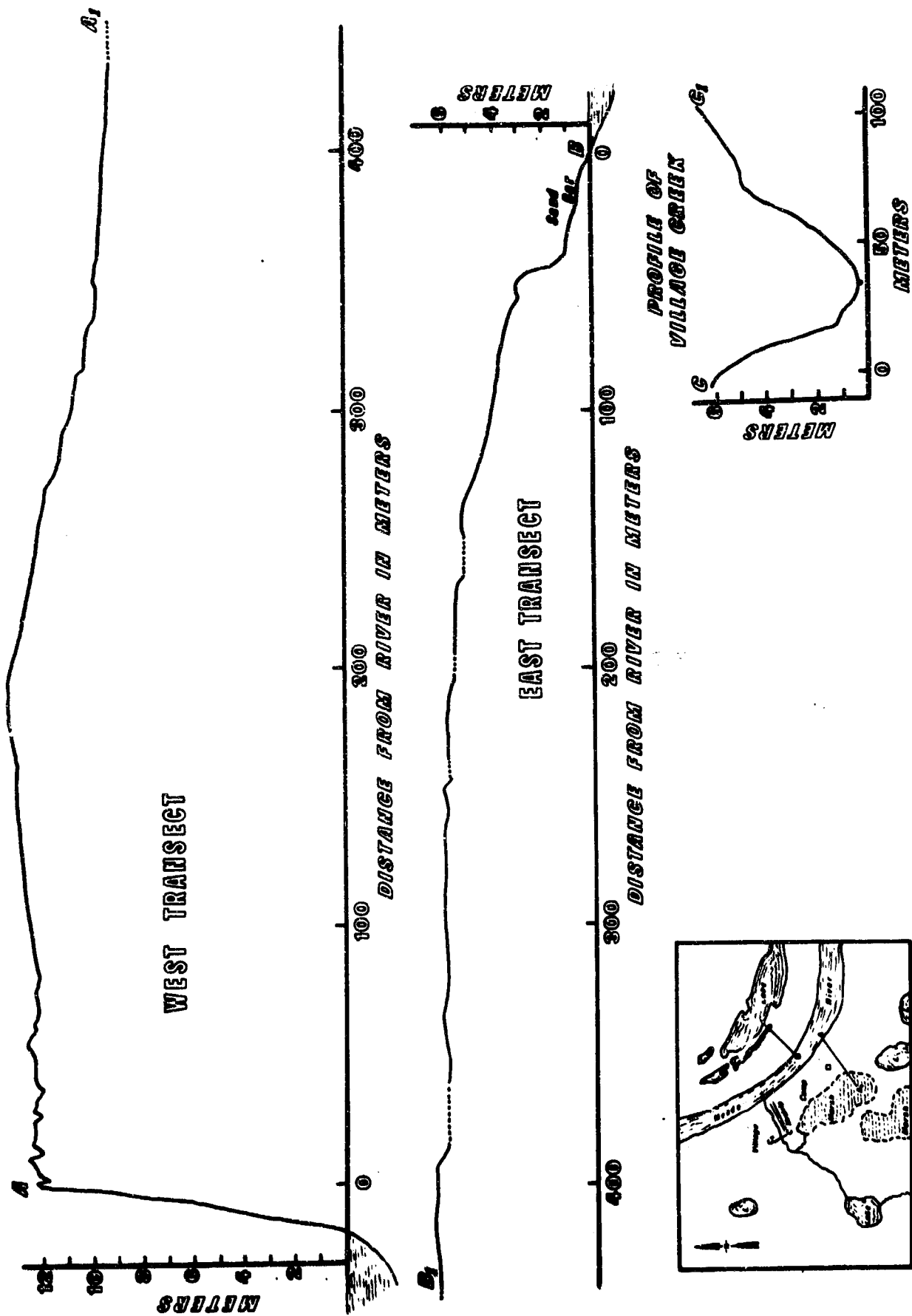


Figure 21. Topographic Profiles of Three Transects at Meade River Camp. Profiles A (upland) and B (river bar) were Probed Weekly for Snow and Thaw Depths.

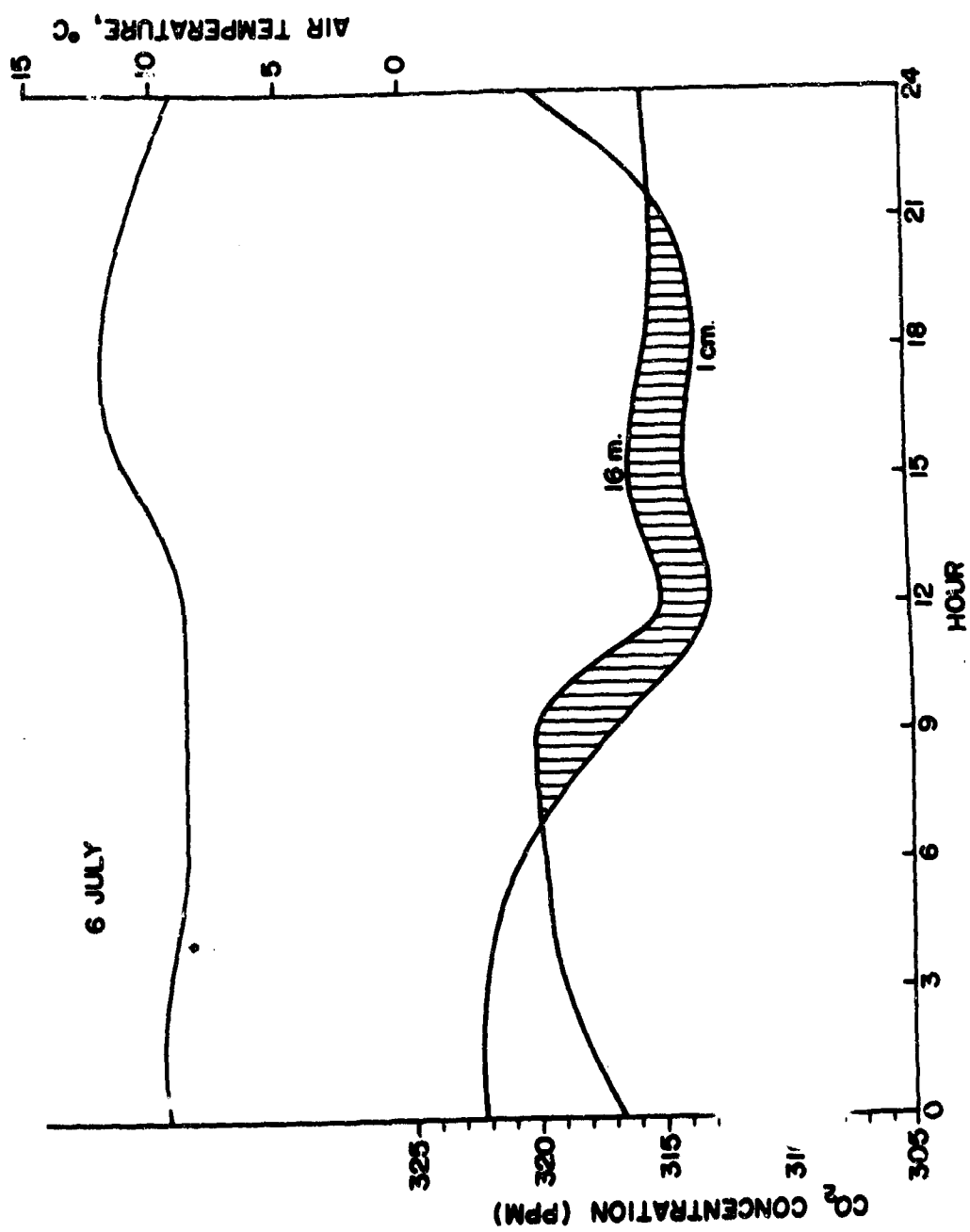


Figure 22. Hourly Carbon Dioxide and Air Temperature at Meade River.

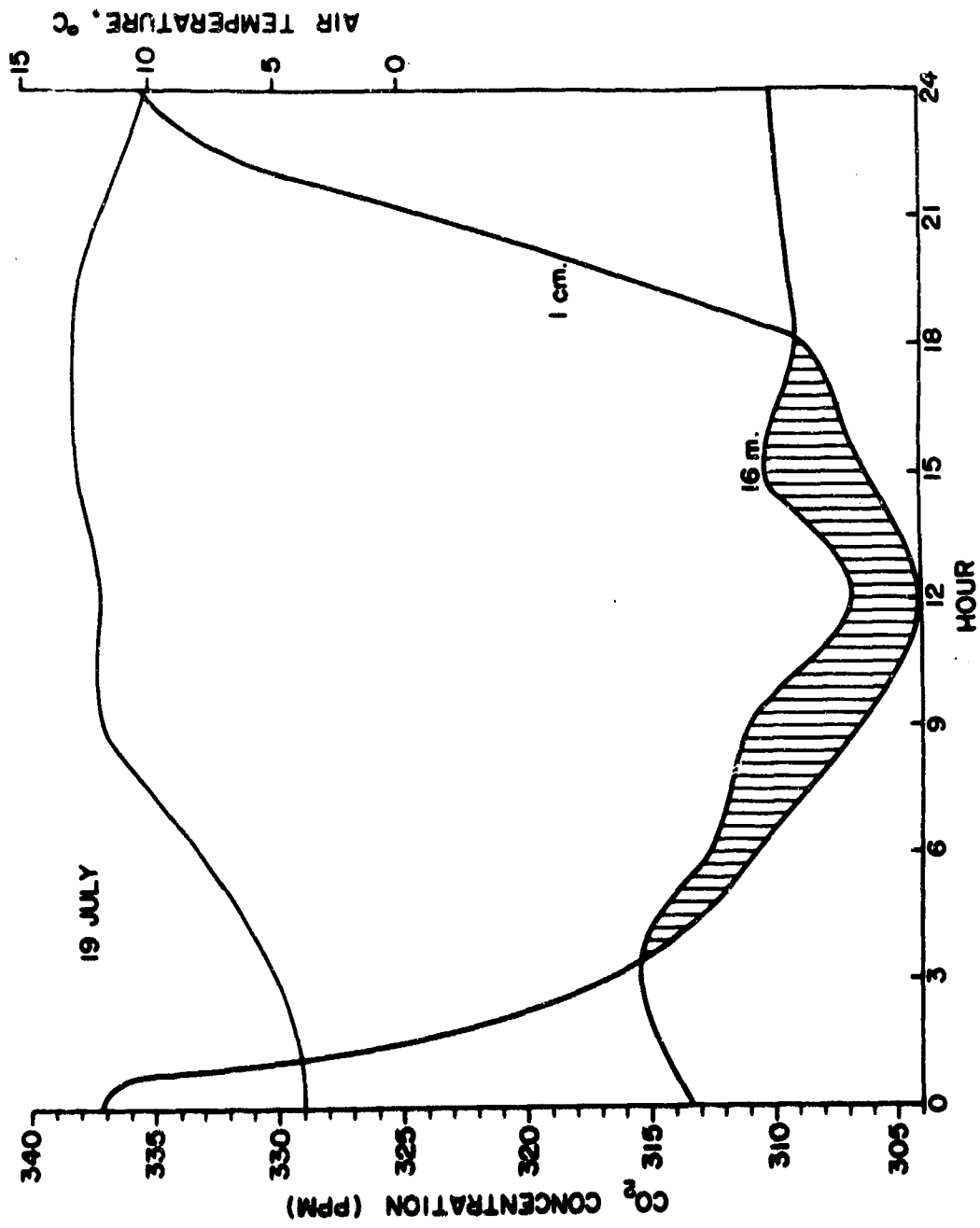


Figure 23. Hourly Carbon Dioxide and Air Temperature at Meade River.

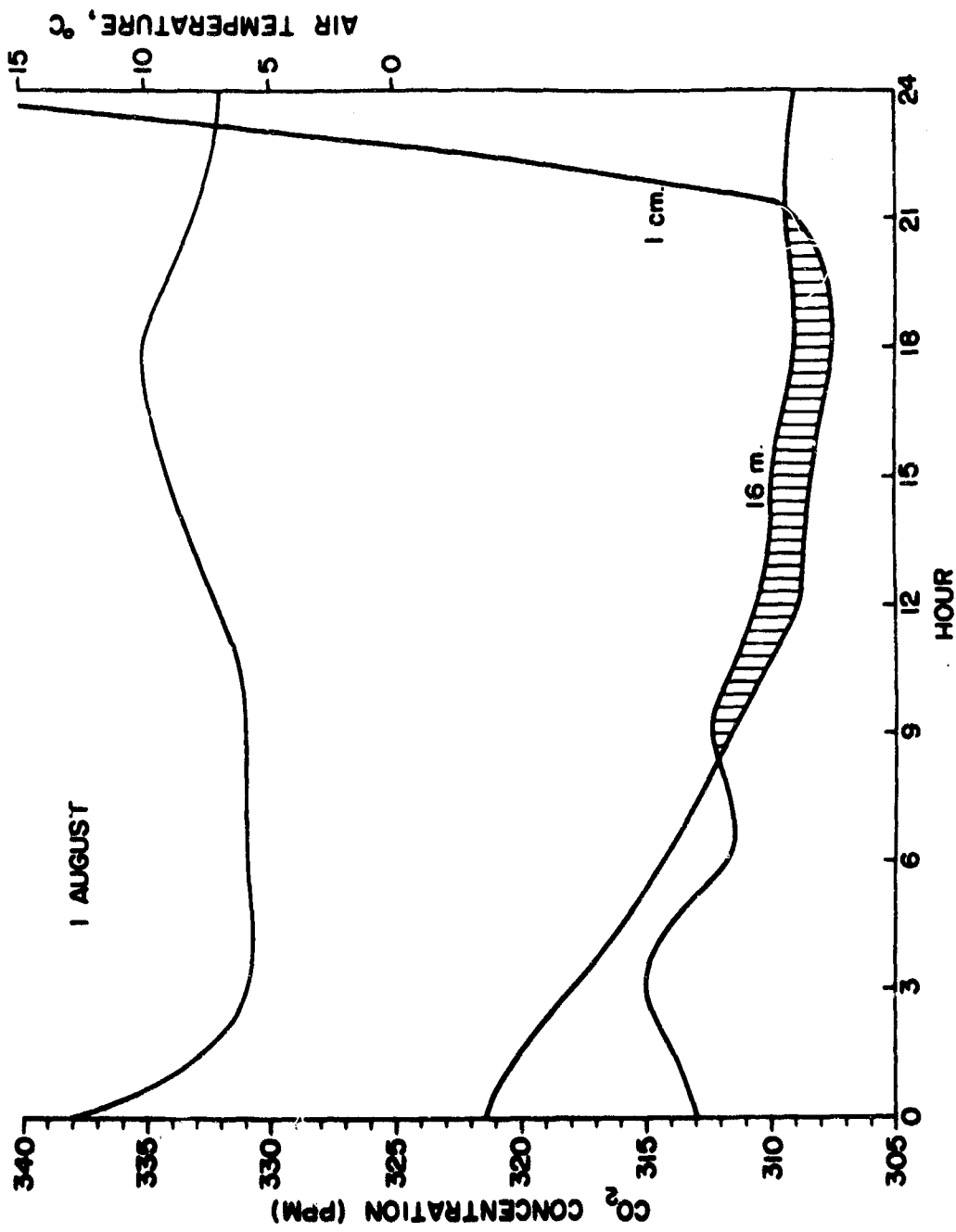


Figure 24. Hourly Carbon Dioxide and Air Temperature at Meade River.



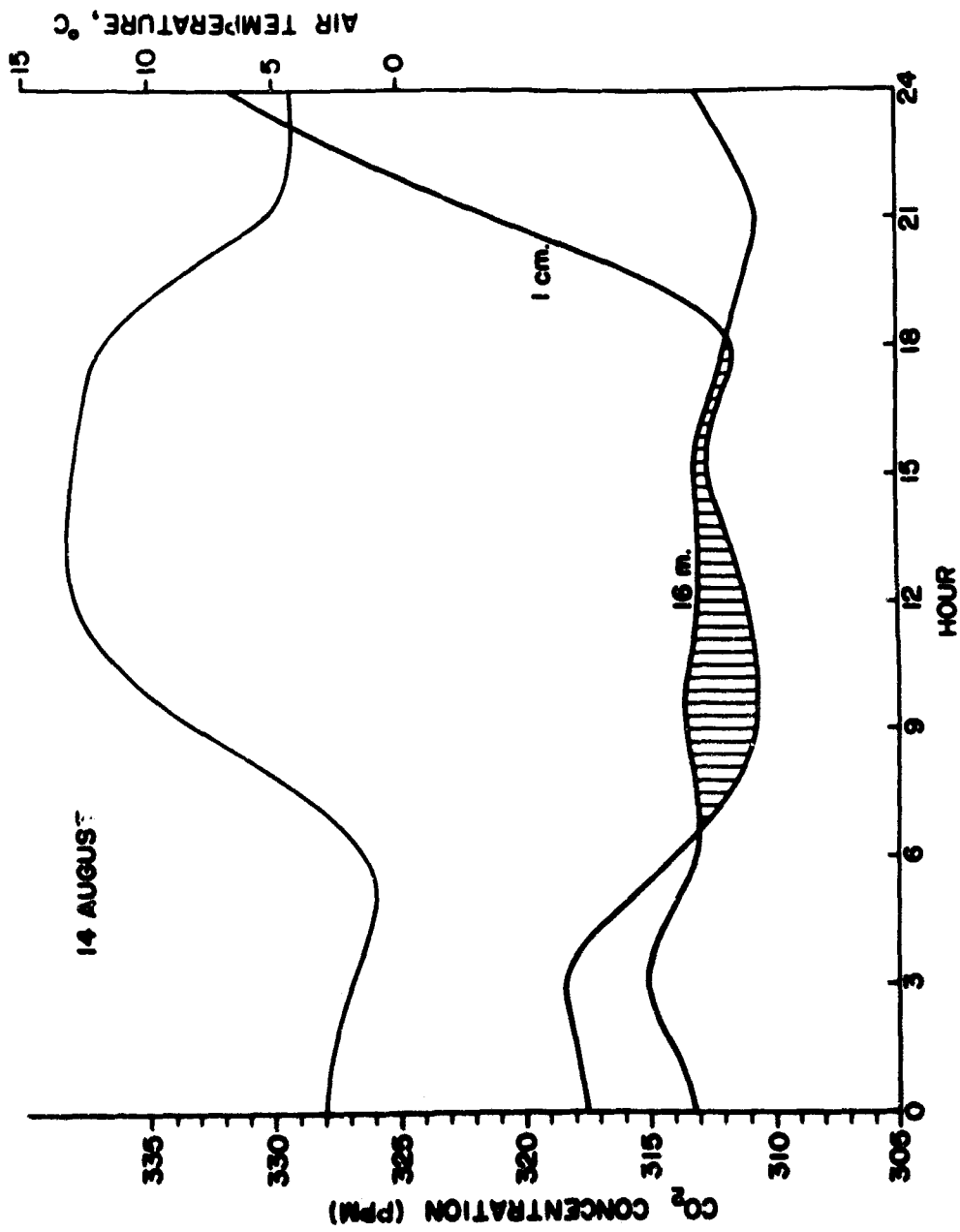


Figure 25. Hourly Carbon Dioxide and Air Temperature at Meade River.

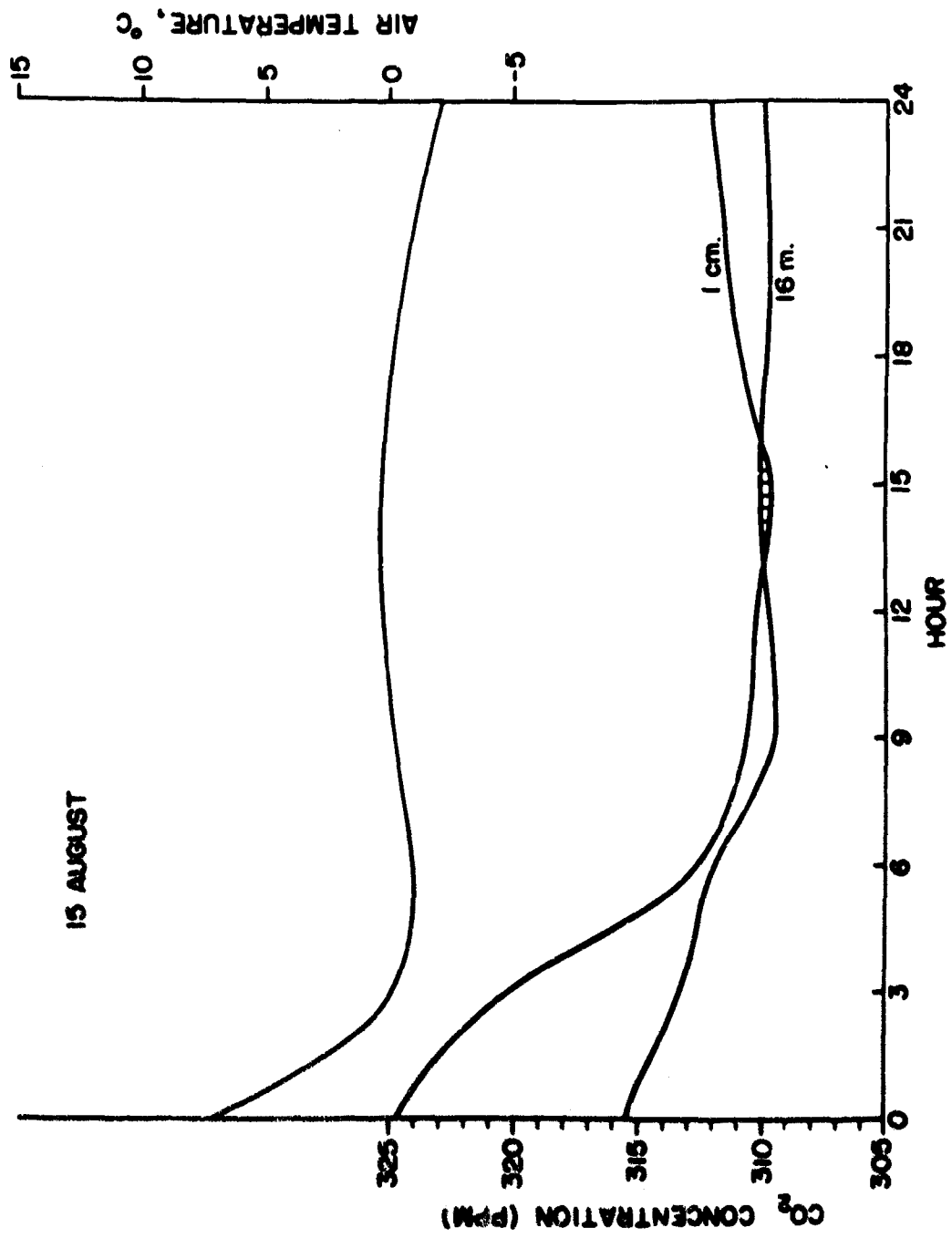


Figure 26. Hourly Carbon Dioxide and Air Temperature at Meade River.

Table 21: Precipitation at Meade River Camp During the  
Growing Season,  
21 May to 10 September 1966 in mm.

Date	4 in.	8 in.	Date	4 in.	8 in.
June 6	.25	T	August 1	4.32	2.78
8	2.79	1.15	2	.51	T
11	2.79	1.89	4	.51	.33
12	5.08	2.78	5	1.52	1.04
15	3.05	1.95	6	.25	T
16	.12	.17	9	T	T
22	T	T	16	.51	.61
24	3.81	(1.23)	17	.51	.38
25	5.59	3.32	18	.76	.56
28	T	T	19	T	
29	4.06	2.54	21	T	T
Mon. 27.54	15.03		22	.25	.24
July 1	.76	.49	24	.25	.14
3	7.62	5.06	25	T	T
4	.25	.14	26	3.05	1.76
6	2.29	1.41	28	4.57	2.90
10	.51	.28	29	22.35	8.90
11	1.02	.80	30	2.03	-
13	7.37	4.28	31	T	T
14	T	T	Mon. 41.40		19.64
16	1.27	.97	Sep. 2	.51	.10
17	.51	.37	3	T	T
18	.51	.37	7	.25	-
20	1.02	.70	8	2.79	-
21	1.27	.76			
22	T	.19			
23	1.02	.19			
26	T	T			
30	.51	.37			
31	.51	.21			
Mon. 26.44	17.08				
			Seasonal		
			Total	98.93	51.85

Two gages were used, one 4 inches square receiving area the other a standard 8 inch gage. Values in brackets are unreliably low values.

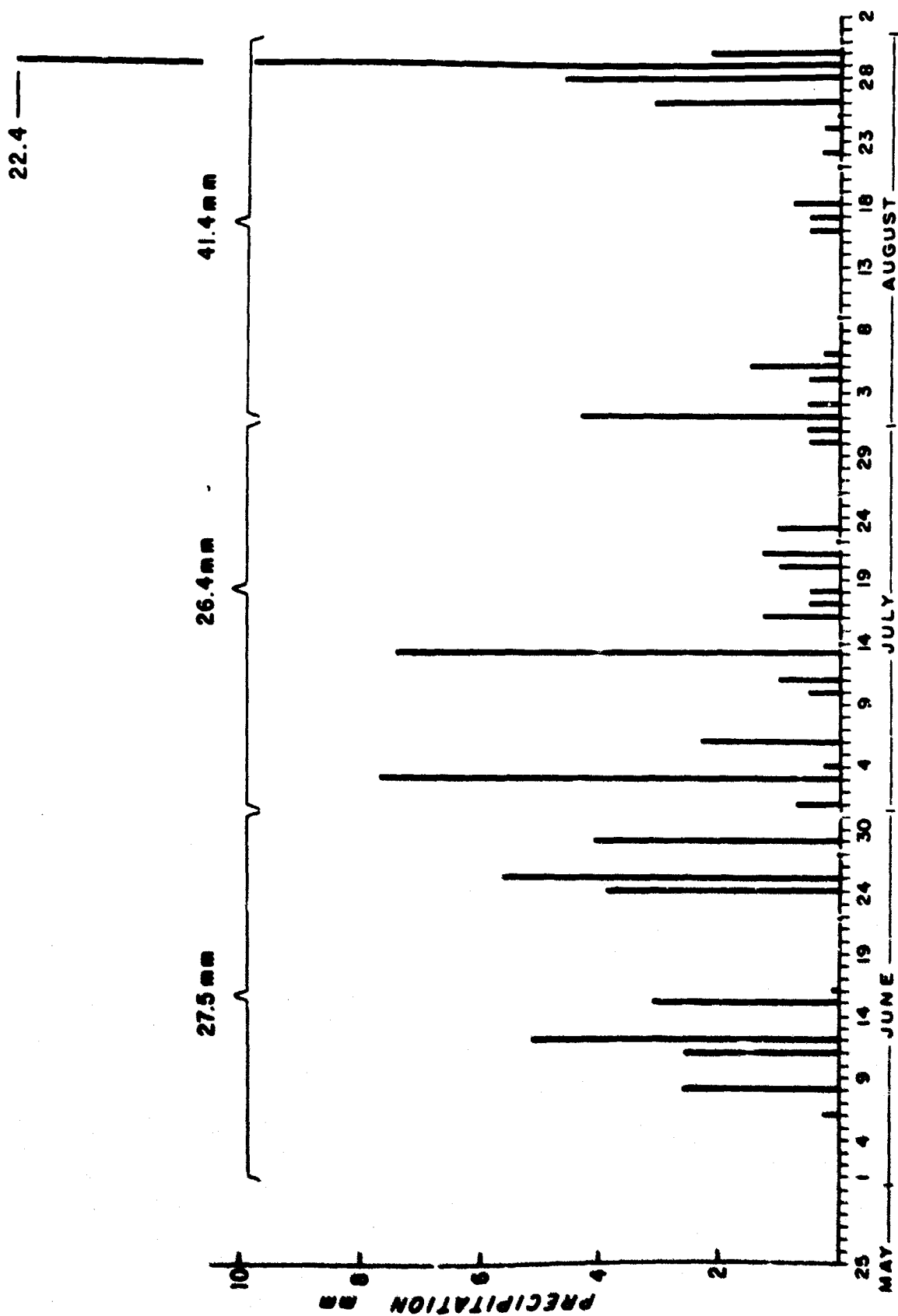


Figure 27. Precipitation Distribution During the 1966 Thaw Season at Meade River.

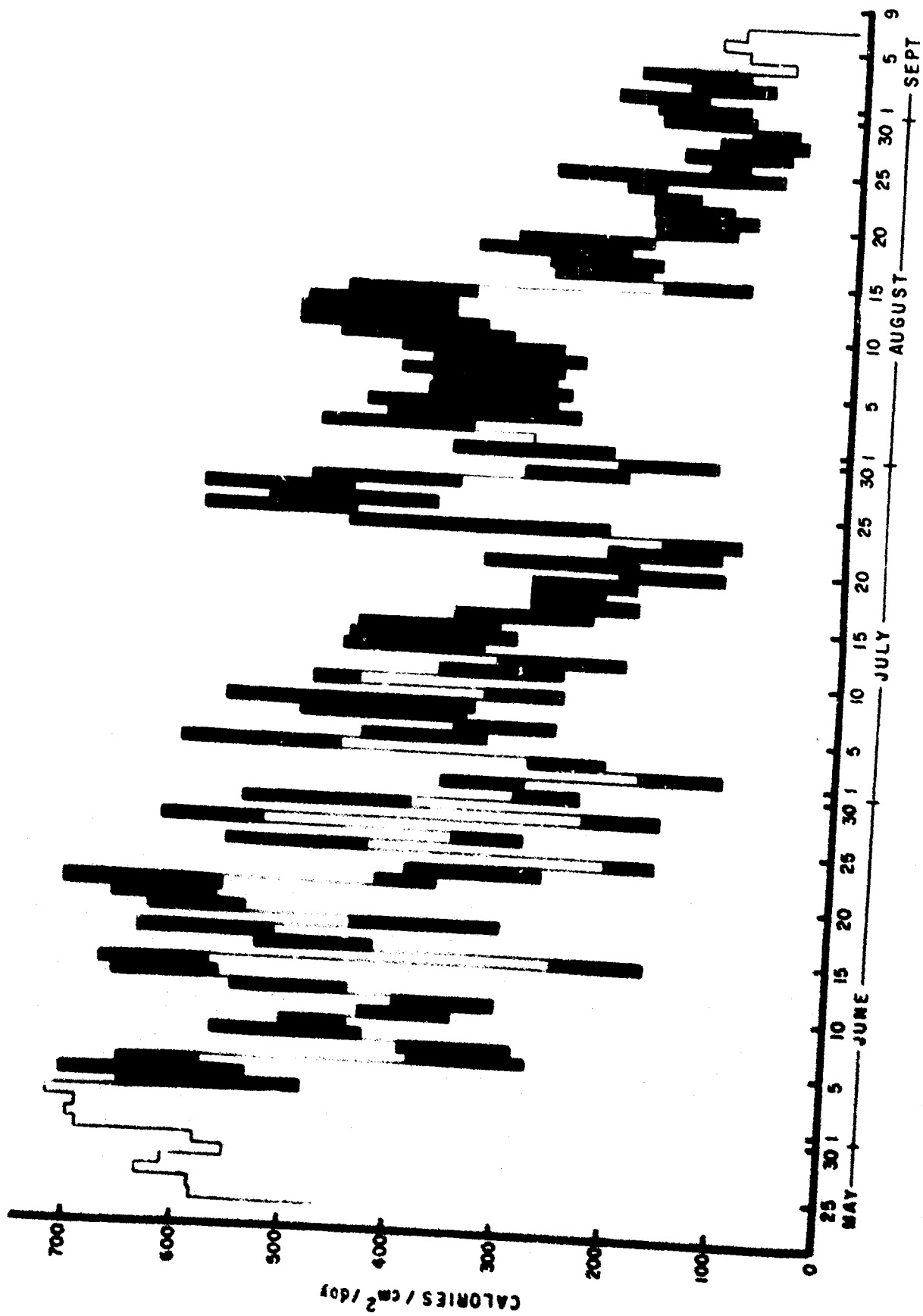


Figure 28. Total Short Wave and Net Solar Radiation During the 1966 Thaw Season at Meade River.

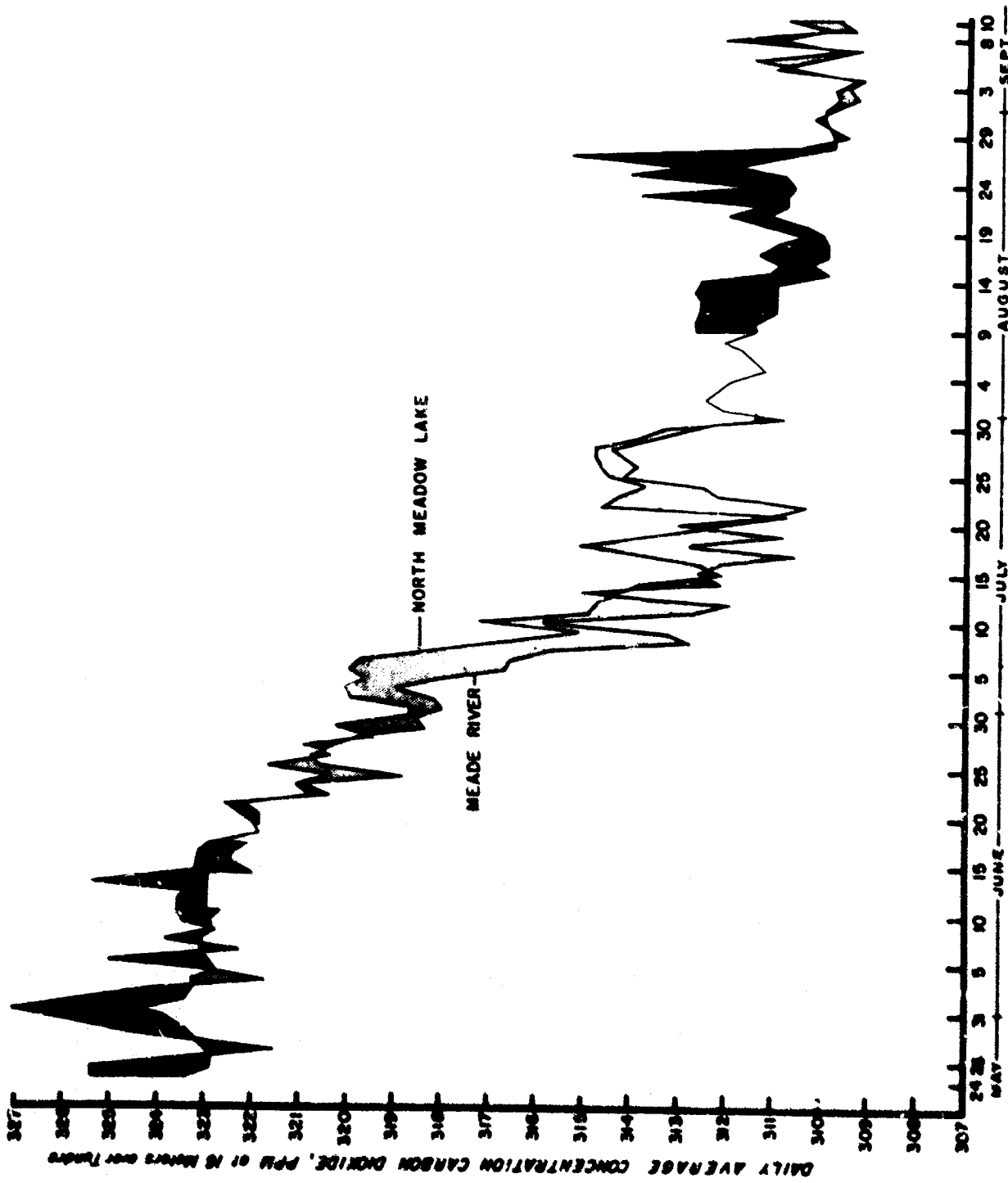


Figure 29. Daily Average Concentration of Carbon Dioxide (ppm) at 16 m Above Tundra at Meade River Camp and North Meadow Lake (Barrow) During the 1966 Thaw Season.

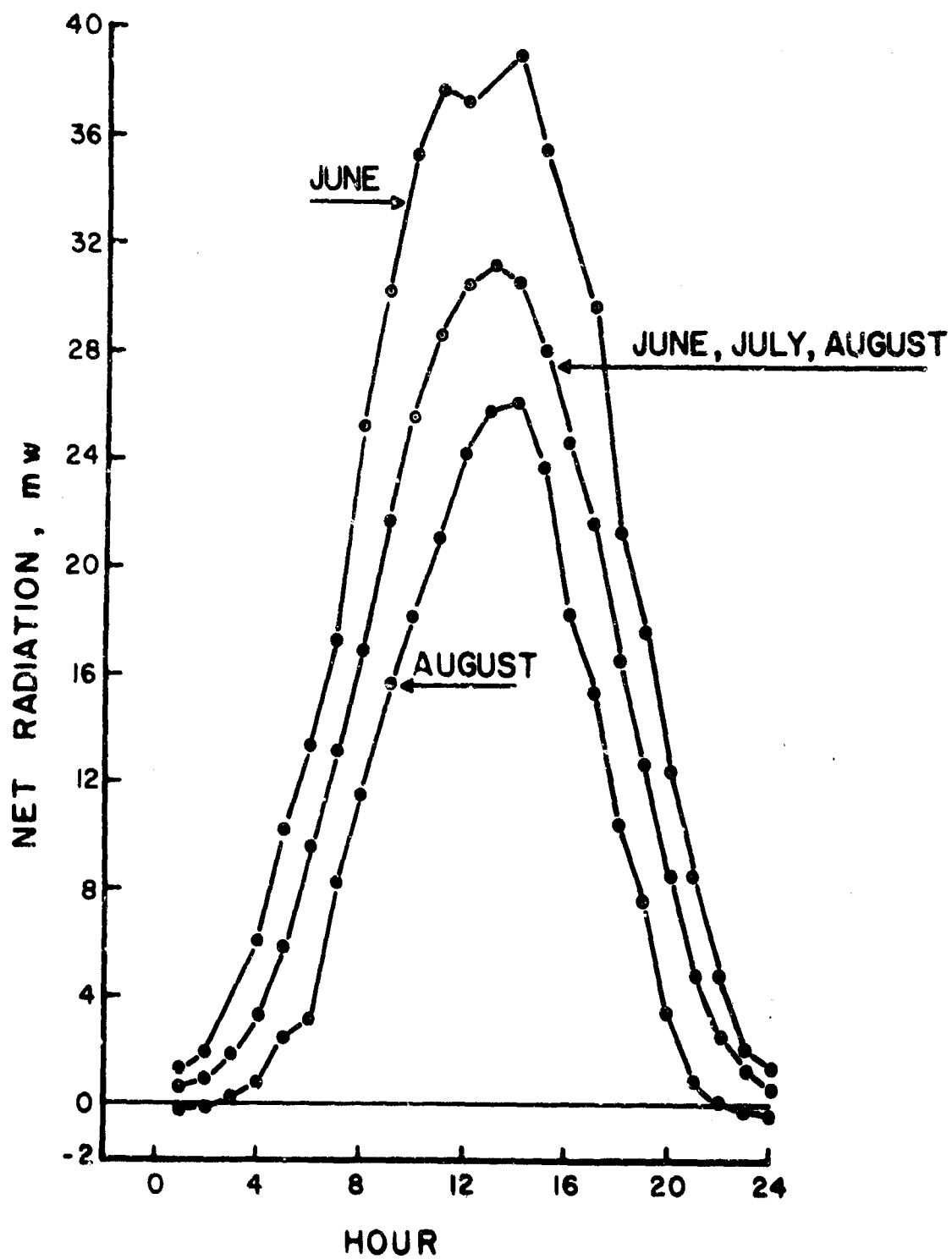


Figure 30. Intensity and Mean Hourly Distribution of Net Radiation at Meade River Camp in June, August, and for Three Summer Months.

Table 22: Open Pan Evaporation Rates, mg/cm<sup>2</sup>

Date	Hour	Rate	Date	Hour	Rate
June 5	1615	-	June 21	0830	-
	1835	20.0		1230	43.5
	2125	9.2		1420	50.7
6	0900	2.2		1600	52.6
	1100	10.5		2400	16.8
	1230	9.8	22	0900	7.7
7	1435	-		1045	19.3
	1635	9.4		1345	14.6
10	1600	7.1	23	1100	8.0
	1430	-		1515	20.9
	1730	26.7	25	1515	-
11	2200	8.5		2040	16.3
	0800	23.4		26	1315
12	1500	13.2	26	1630	17.1
	1800	16.0		2025	14.1
	0830	19.5	27	0800	2.5
13	1130	23.6		1030	35.3
	1430	30.6		1910	25.4
	1730	29.3	29	1140	-
14	2230	5.3		1900	28.7
	0930	9.3		30	1040
15	1130	36.3	July 1	1010	3.3
	1330	43.5		4	0900
	1530	39.1		1100	26.5
18	1830	27.1	6	1630	38.0
	0830	7.2		2315	12.7
	1130	41.6	7	2145	-
19	1430	47.1		0910	2.0
	1730	43.8		2335	14.8
20	1130	11.0	8	0915	4.3
	1100	-		1420	25.7
	1230	32.2	9	2130	0
21	1600	17.1		0935	38.2
	2330	7.4		13	1400
22	1145	9.9	14	1600	26.3
	1330	36.1		1930	18.6
	1750	50.2		2230	13.6
23	2345	8.8	15	0930	4.9
	0900	8.0		1800	27.3
	1100	35.8	16	0900	5.3
24	1300	36.6		0830	5.7
	1500	46.0		1245	17.5
	2030	27.0		1945	62.4



Table 22 continued

Date	Hour	Rate	Date	Hour	Rate
July	16	2230	August	14	1045
	17	1210			1715
	18	1000		17	0950
	19	0810			2300
	20	1035		18	1245
	21	0950			2000
		1312		19	0745
		1920			1245
	22	1000			2000
		1325		20	0840
		1925			1230
	24	1300		21	0830
		2330		22	0900
	25	1030		23	0845
		1700		24	0930
		1935			1900
	26	1230		25	1010
		1840		26	0930
	27	1100		27	0840
	28	1010			
		1500			
		1910			
		2030			
August	1	1015			
	2	0850			
		1245			
		2345			
	3	1010			
		1650			
	4	1300			
		2245			
	7	1015			
		1430			
	8	1100			
		1400			
		2010			
	9	1015			
		1320			
		2150			
	10	0900			
		1400			
		2000			
	11	0900			
		1740			
	12	1000			
		1250			
	13	0930			
		1650			

Note: These values are based on periodic weighing of a shallow polished 9 inch baking tin.

Table 23: Average Daily Wind Velocities  
During the Thaw Season  
at  
Meade River Camp, 1966

Date	mph	Date	mph	Date	mph
May 26	6.8	June 29	3.9	August 2	3.8
27	4.9	30	4.7	3	7.1
28	6.3	July 1	4.8	4	6.7
29	2.5	2	6.2	5	9.4
30	3.0	3	9.4	6	10.3
31	3.2	4	8.9	7	13.8
June 1	4.5	5	8.1	8	13.6
2	5.7	6	4.2	9	11.4
3	2.5	7	3.4	10	7.1
4	3.6	8	6.1	11	8.3
5	1.4	9	6.0	12	7.5
6	1.8	10	10.2	13	8.0
7	9.5	11	7.2	14	6.6
8	10.5	12	6.8	15	4.2
9	6.7	13	8.5	16	7.2
10	6.1	14	7.4	17	6.5
11	3.3	15	4.3	18	5.2
12	3.8	16	7.7	19	8.2
13	4.6	17	7.3	20	5.7
14	3.0	18	10.5	21	2.0
15	3.5	19	6.6	22	2.7
16	2.9	20	3.7	23	2.2
17	4.4	21	6.5	24	4.1
18	6.5	22	8.6	25	4.1
19	7.4	23	4.2	26	5.4
20	4.5	24	4.1	27	4.6
21	7.5	25	4.8	28	4.6
22	5.5	26	9.1	29	14.0
23	6.4	27	9.6	30	12.4
24	13.7	28	6.1	31	11.6
25	10.4	29	3.8	Sept. 1	11.6
26	9.0	30	4.1	2	10.7
27	-	31	5.2	3	8.1
28	3.5	August 1	6.2	4	6.6

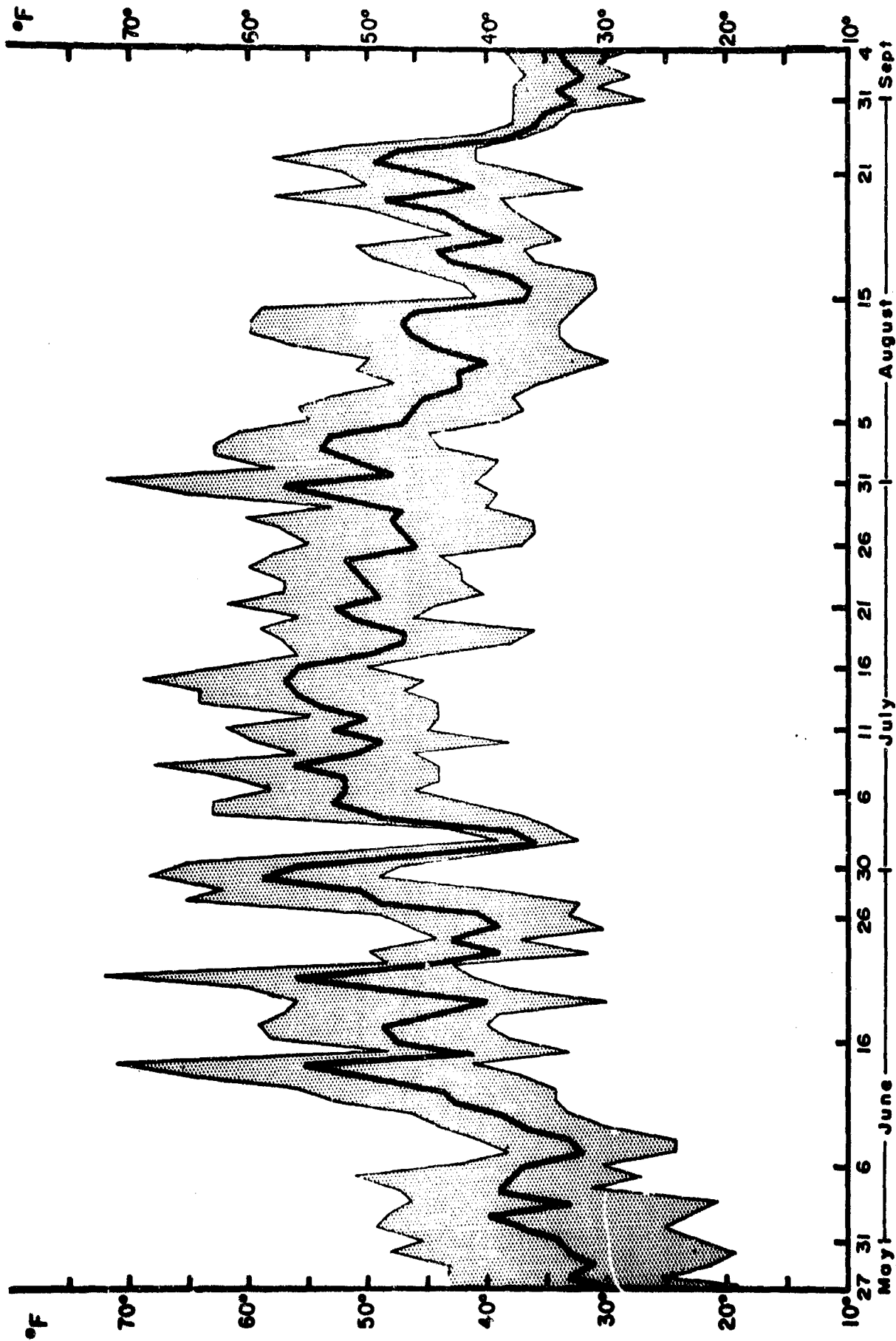


Figure 31. Progression of Daily Mean, Maximum and Minimum Temperatures  
Based on Five Six's-Type Mercury Thermometers at 5 cm  
Height in a Screen.

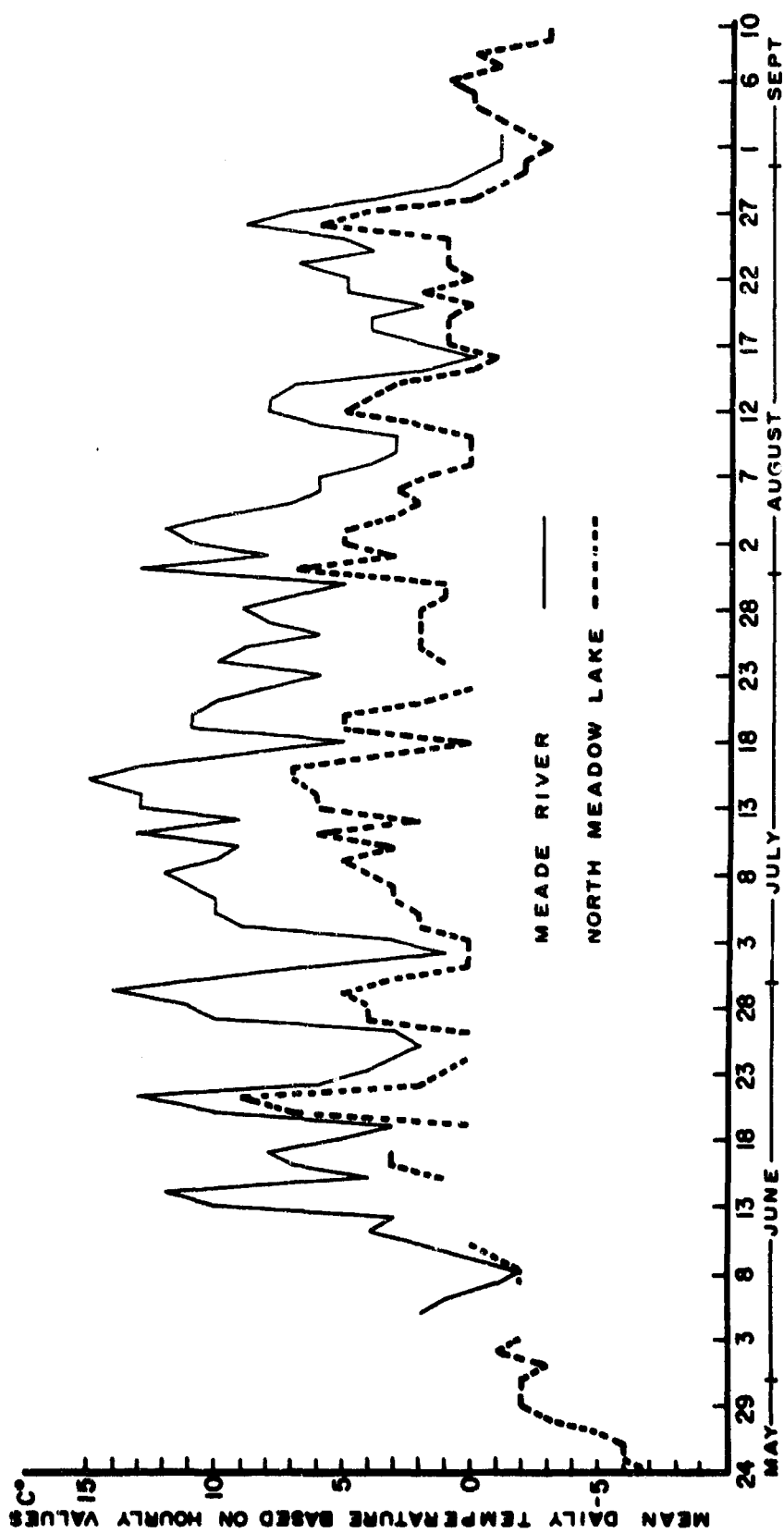


Figure 32. Comparison of Mean Daily Temperatures Based on Hourly Thermograph Values at 5 cm Height at Barrow and Meade River.

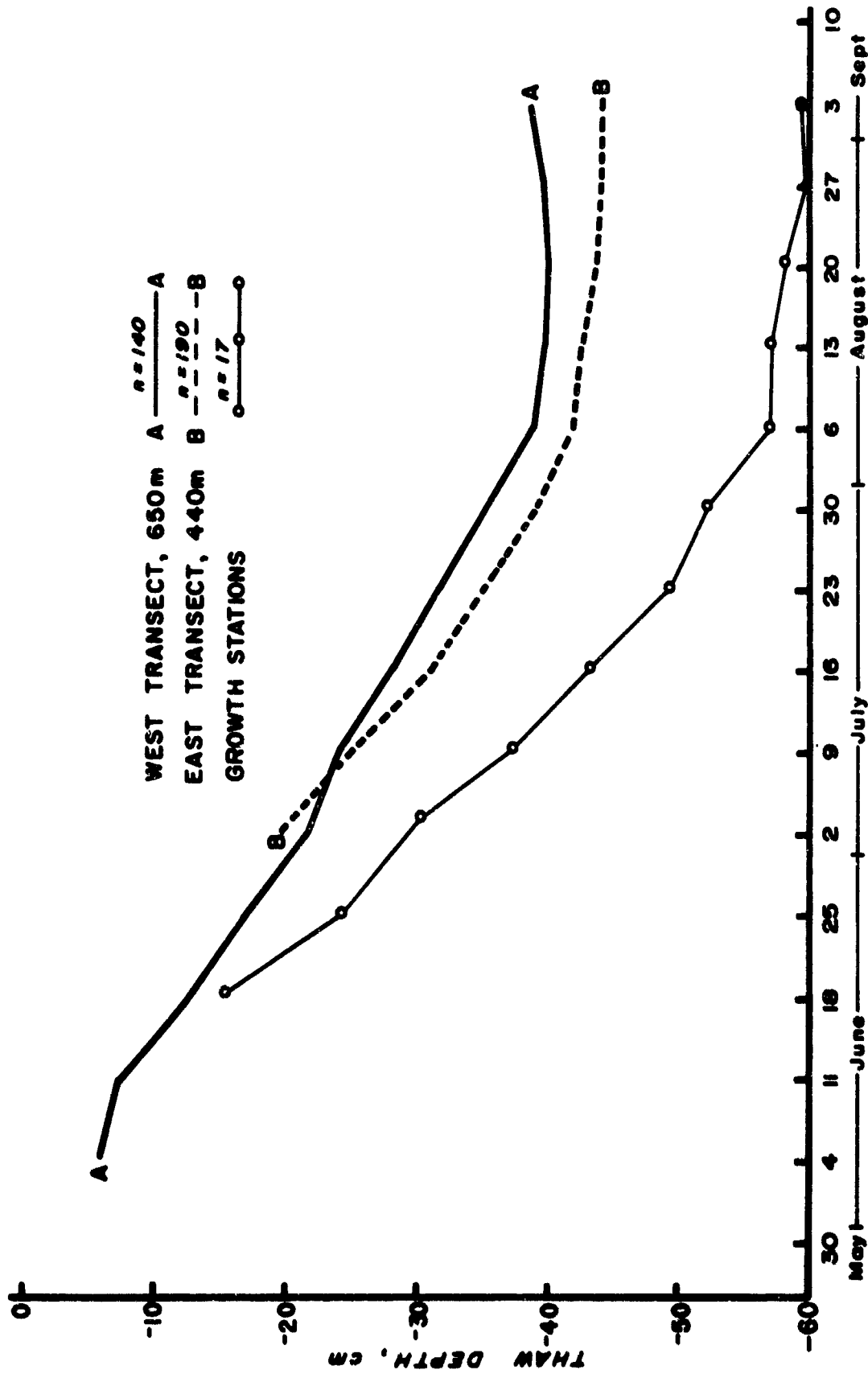


Figure 33. Progression of Thaw in 1966 as an Average 190 Points on Transect A, 140 Points on Transect B, and at 17 Plant Growth Stations.

Table 24: Survey Chemistry of Meade River Water, 1966

Date	Turbidity JTU	Conductance Micromhos	Total Alkalinity	Total Hardness	CaCo <sub>3</sub>	MgCo <sub>2</sub>	Fe ppm	Cl	NaCl	SO <sub>4</sub>	Si ppm
June 26	27	73	45	65	20	6	0.25	5	8.3	-	-
July 3	30	82	40	70	30	8	0.28	5	8.3	-	-
July 11	80	91	40	90	35	6	0.32	2.5	4.1	-	-
July 17	40	92	50	80	40	6	0.33	2.5	4.1	7	2.3
Aug. 7	32	107	65	90	40	12	0.26	10	16.5	-	-
Aug. 14	70	-	60	70	40	10	0.32	5	8.3	-	-
Aug. 21	25	130	70	85	45	10	0.20	5	8.3	5	1.7
Aug. 27	-	135	-	-	-	-	-	-	-	-	-
Sept. 4	50	119	70	80	40	12	0.50	5	8.3	-	-

Note: Test performed with Hach Chemical Kit Model DR-EL. Tests for nitrate, nitrite Mn and PO<sub>4</sub> were negative.

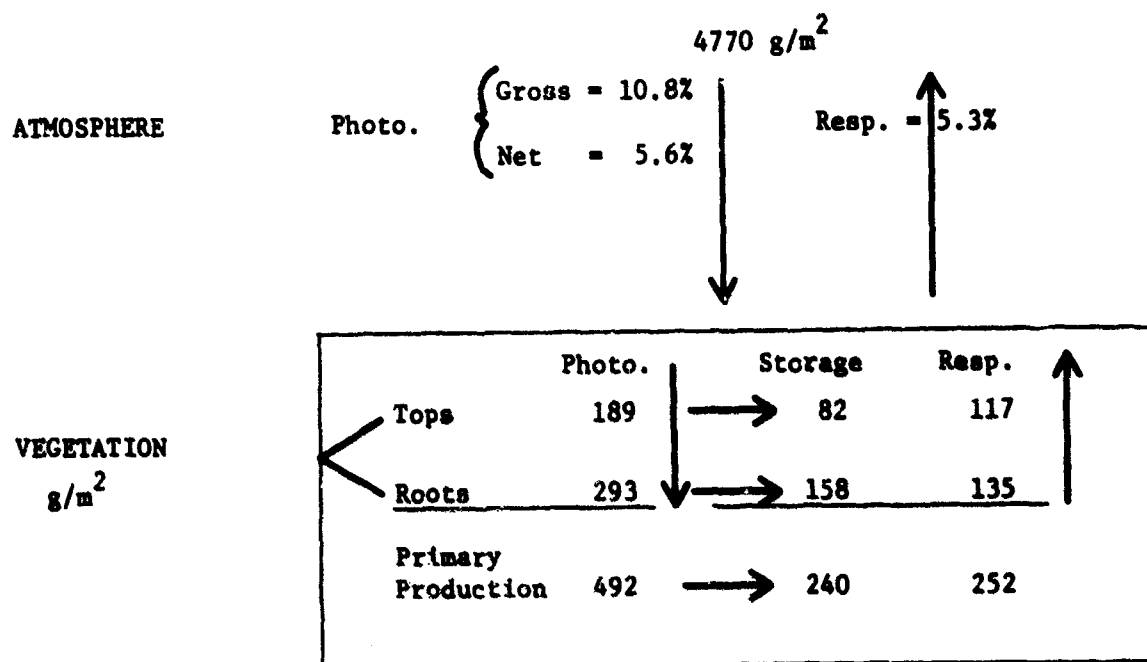


Figure 34. Dry Matter Production in an Arctic Tundra Ecosystem at Meade River, 1966.

TABLE 25: Harvested Biomass at Meade River, 1966

Vegetation Type		Standing Crop, g/m <sup>2</sup>		
		30 June	30 July	30 August
Dwarf Willow ( <i>Salix pulchra</i> )	Foliage	54	76	94
	Litter	566	199	387
Cottongrass Tussock ( <i>Eriophorum vaginatum</i> )	Foliage	83	86	57
	Litter	651	375	400
Dry Sedge Meadow ( <i>Carex consimilis</i> )	Foliage	42	45	35
	Litter	256	165	229
Wet Sedge Meadow ( <i>Carex aquatilis</i> )	Foliage	21	79	72
	Litter	--	159	158
Sedge Pond ( <i>Carex aquatilis</i> )	Foliage			67
	Litter			132



Table 26: Standing Crop of Eight Photosynthesis Sites

Site	Vegetation Type	Dry Weight Live, g/m <sup>2</sup>	Chamber Litter, g/m <sup>2</sup>	Ratio Live/Dead
1.	Carex aquatilis (wet tundra)	62.1	62.6	0.99
2.	Carex aquatilis (snowbed)	42.4	61.2	0.70
3.	Salix phlebophylla (ridge)	85.5	213.6	0.40
4.	Salix Phlebophylla (ridge)	62.2	180.9	0.34
5.	Eriophorum vaginatum (polygon trough)	260.0	1221.8	0.21
6.	Eriophorum vaginatum (upland tundra)	95.8	1072.1	0.09
7.	Carex aquatilis (pond)	42.6	150.3	0.29
8.	Carex aquatilis (pond)	44.1	150.3	0.29

TABLE 27: Growth Increment of Six Species at Meade River in 1966

Species	Units Measured	Standing crop/unit, dry mg
<i>Betula glandulosa</i> (birch)	40 twigs	46
<i>Salix pulchra</i> (willow)	30 twigs	121
<i>Carex aquatilis</i> (sedge)	30 ramet	151
<i>Carex consimilis</i> (sedge)	20 ramet	120
<i>Eriophorum vaginatum</i> (cotton grass)	4 tussocks	11020
<i>Polygonum bistorta</i> (bistort)	20 tops	620
	20 roots and corm	1500

TABLE 28: WEEKLY PLANT GROWTH AT MEADE RIVER, ALASKA

(Mean of 10 Plants, mm)

Species	Site	16 June	25 June	2 July	9 July	16 July	23 July	30 July	6 August	13 August	20 August
Salix pulchra	1	12	21	32	42	55	59	60	61	59	59
	2	11	21	30	41	47	48	49	49	49	49
	3	7	16	25	34	37	38	38	38	39	38
Betula glandulosa	1	3	5	9	13	18	22	25	27	28	26
	2	3	3	5	15	25	28	30	31	33	32
	3	6	7	18	24	29	32	34	35	36	35
	4	12	17	22	27	32	33	34	34	35	34
Carex aquatilis	1	91	104	133	152	179	199	222	227	227	211
	2	56	85	110	139	165	178	188	188	176	164
	3	75	94	125	159	195	222	226	233	231	222
Carex consimilis	1	43	72	110	140	161	171	187	186	184	180
	2	38	59	70	85	104	114	123	126	127	120
Eriophorum vaginatum (leaves)	1	51	60	79	85	92	97	98	103	107	100
	2	73	82	105	109	125	134	133	115	105	106
(inflorescence)	1	82	106	132	149	160	160	162	154	161	161
	2	85	99	117	130	137	135	138	133	142	152
Polygonum bistorta (leaves)	1		146	184	223	203	193	190	43	44	41
	2		126	165	185	186	181	145	64	67	79
(inflorescence)	1		34	40	56	97	126	139	131	142	139
	2		28	34	65	123	140	142	139	148	139

106

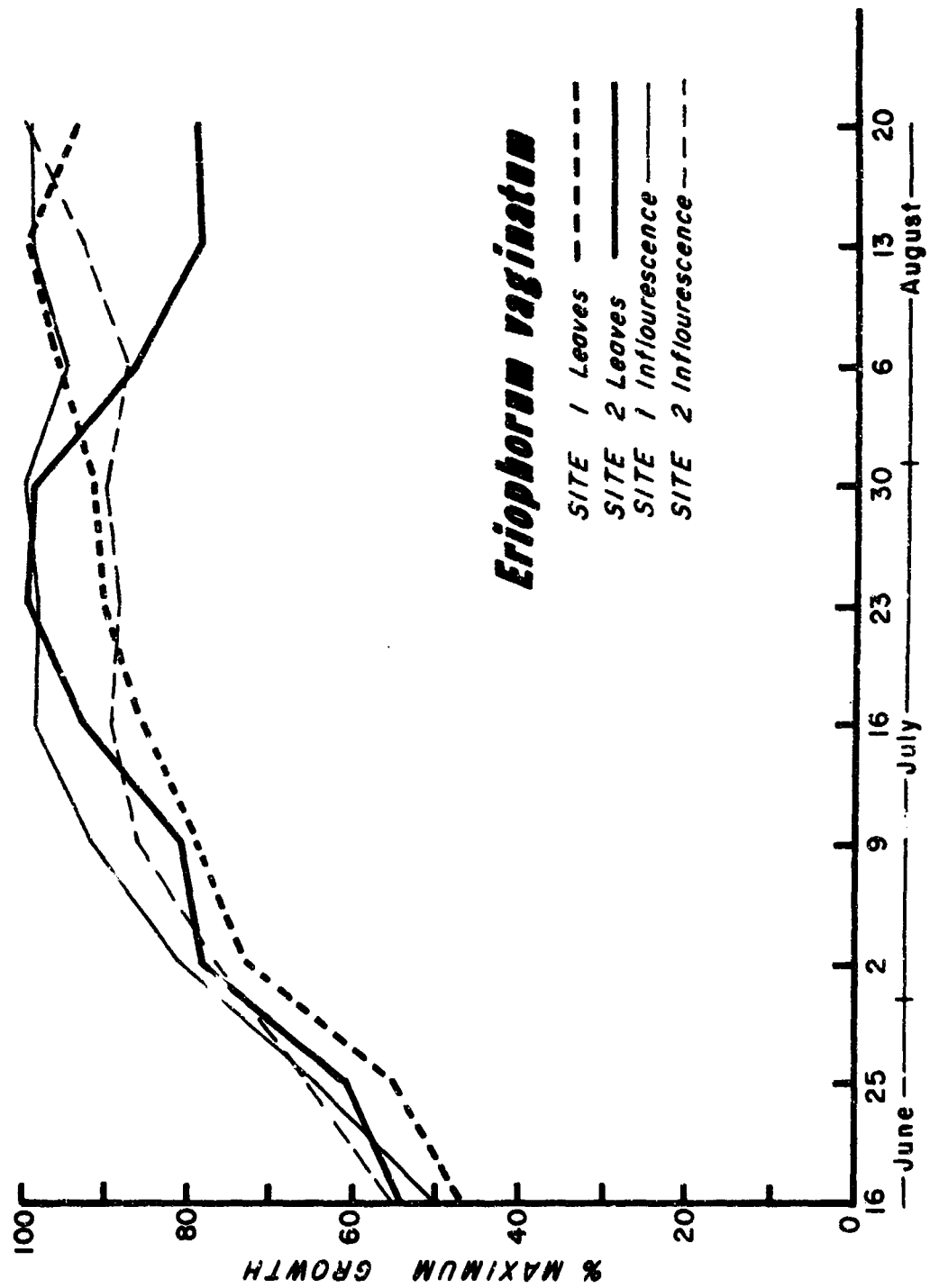


Figure 35. Growth Rates of Six Species at Meade River.

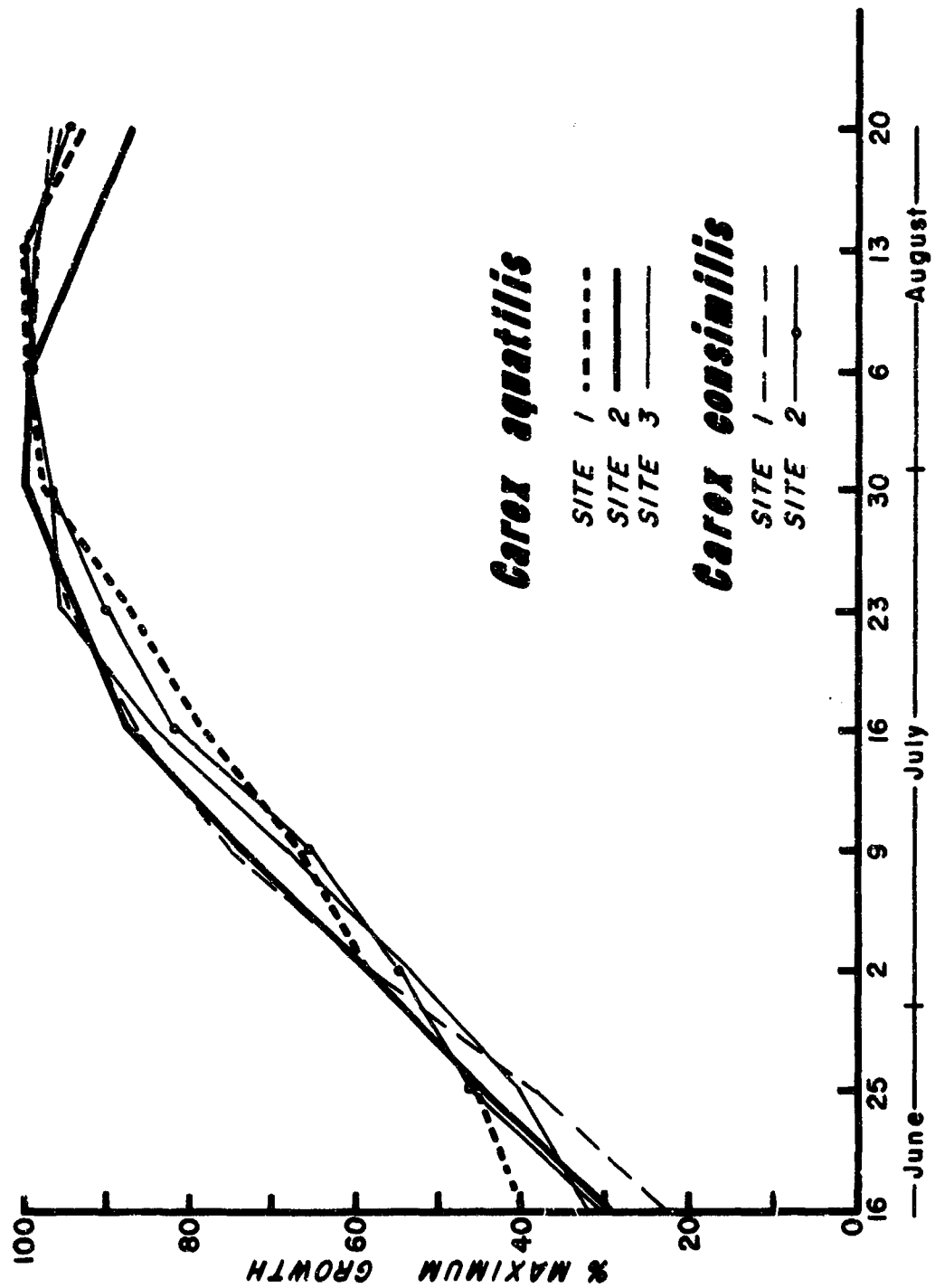


Figure 36. Growth Rates of Six Species at Meade River.

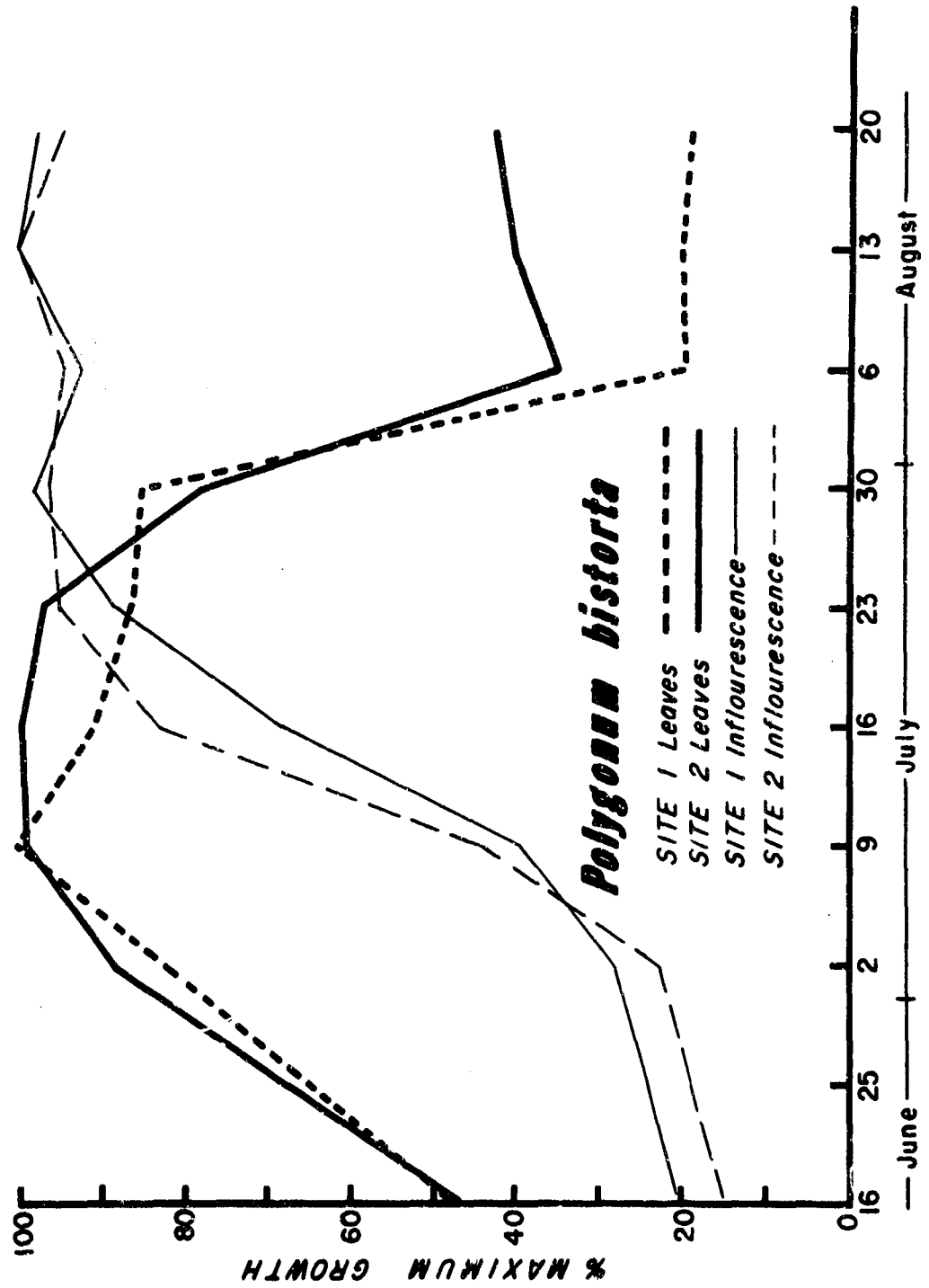


Figure 37. Growth Rates of Six Species at Meade River.

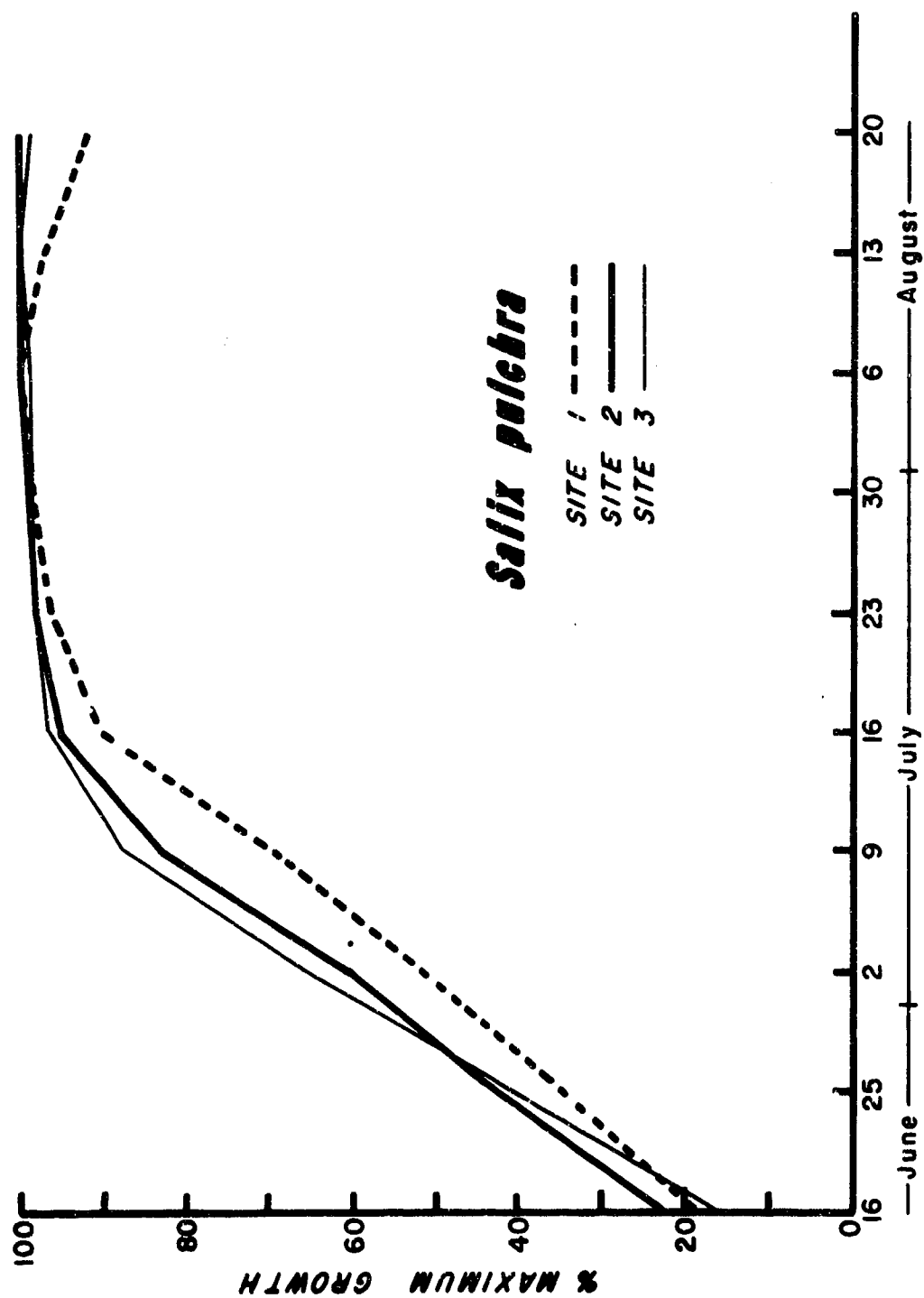


Figure 38. Growth Rates of Six Species at Meade River.

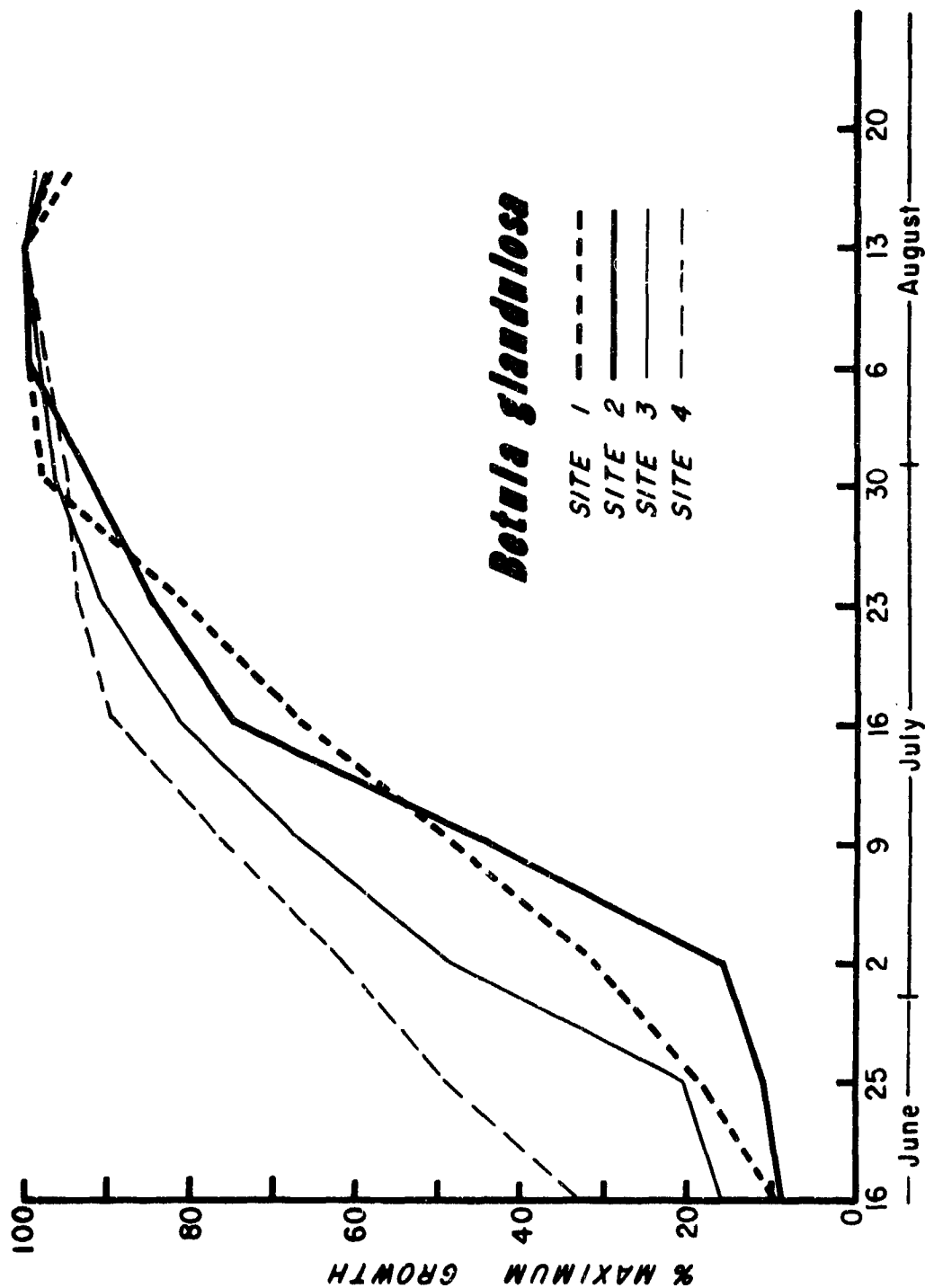


Figure 39. Growth Rates of Six Species at Meade River.



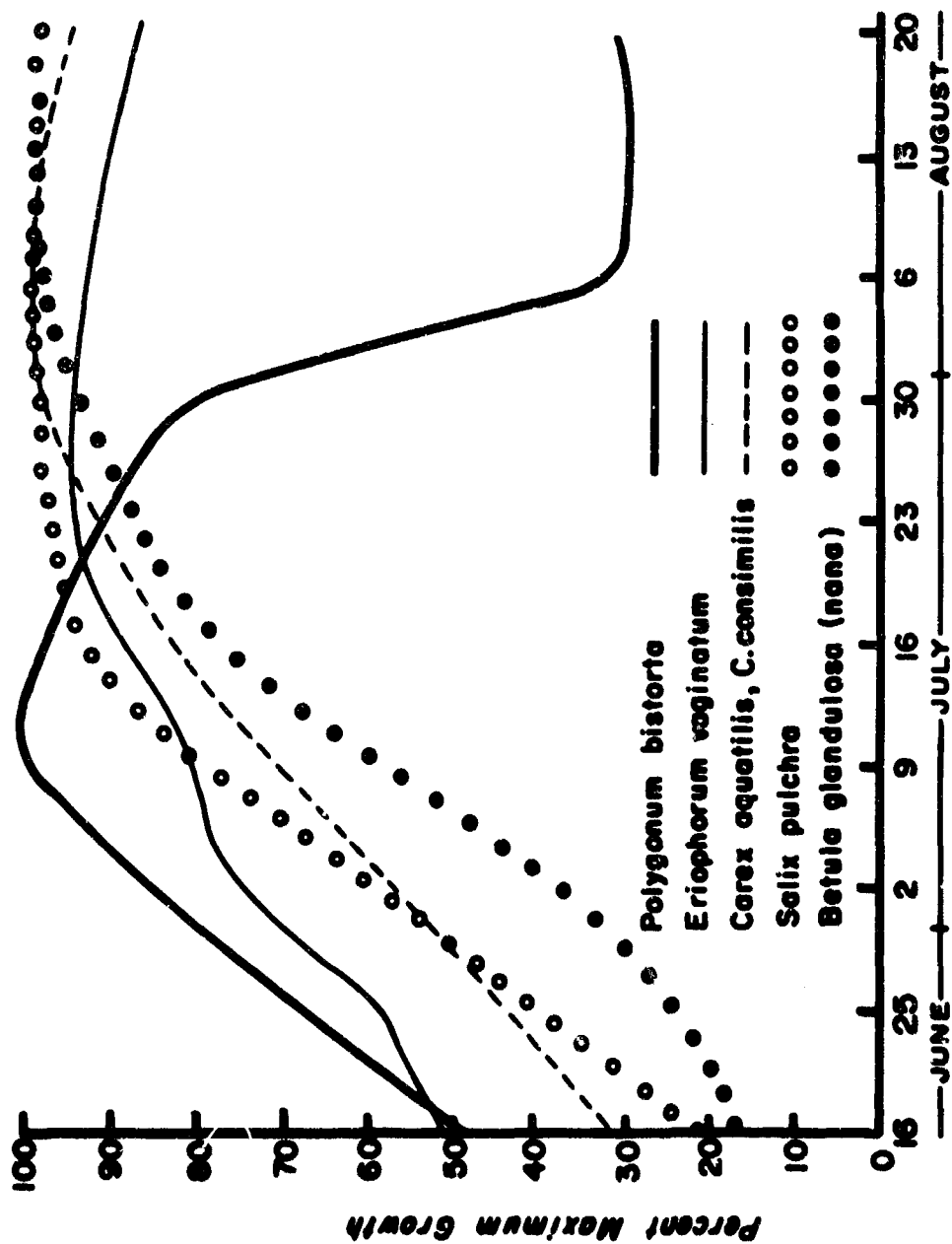


Figure 40. Growth Rates of Six Species at Meade River.

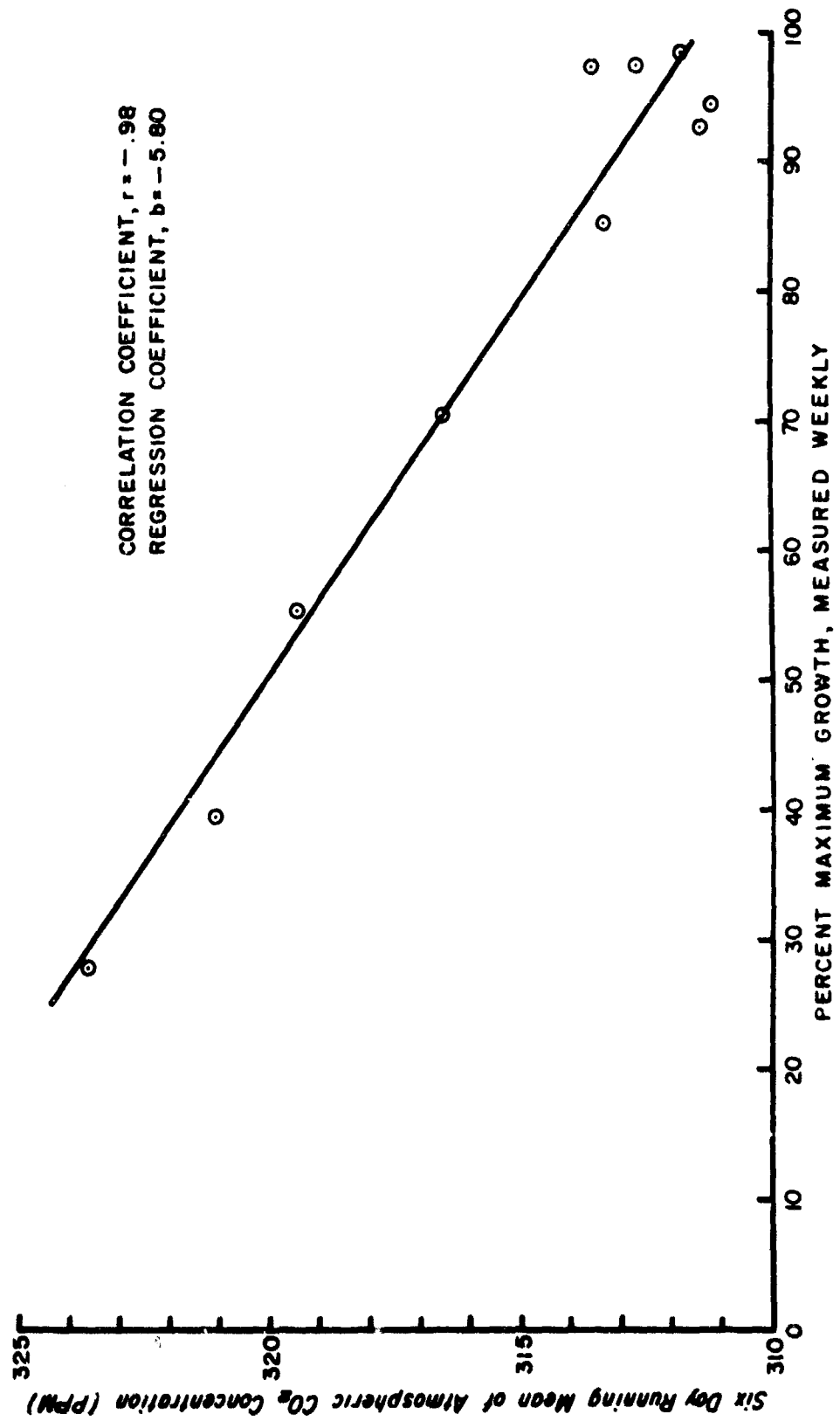


Figure 41. Regression of Six-Day Carbon Dioxide Concentration at 16 m on Percentage of Maximum Plant Growth at Heade River.

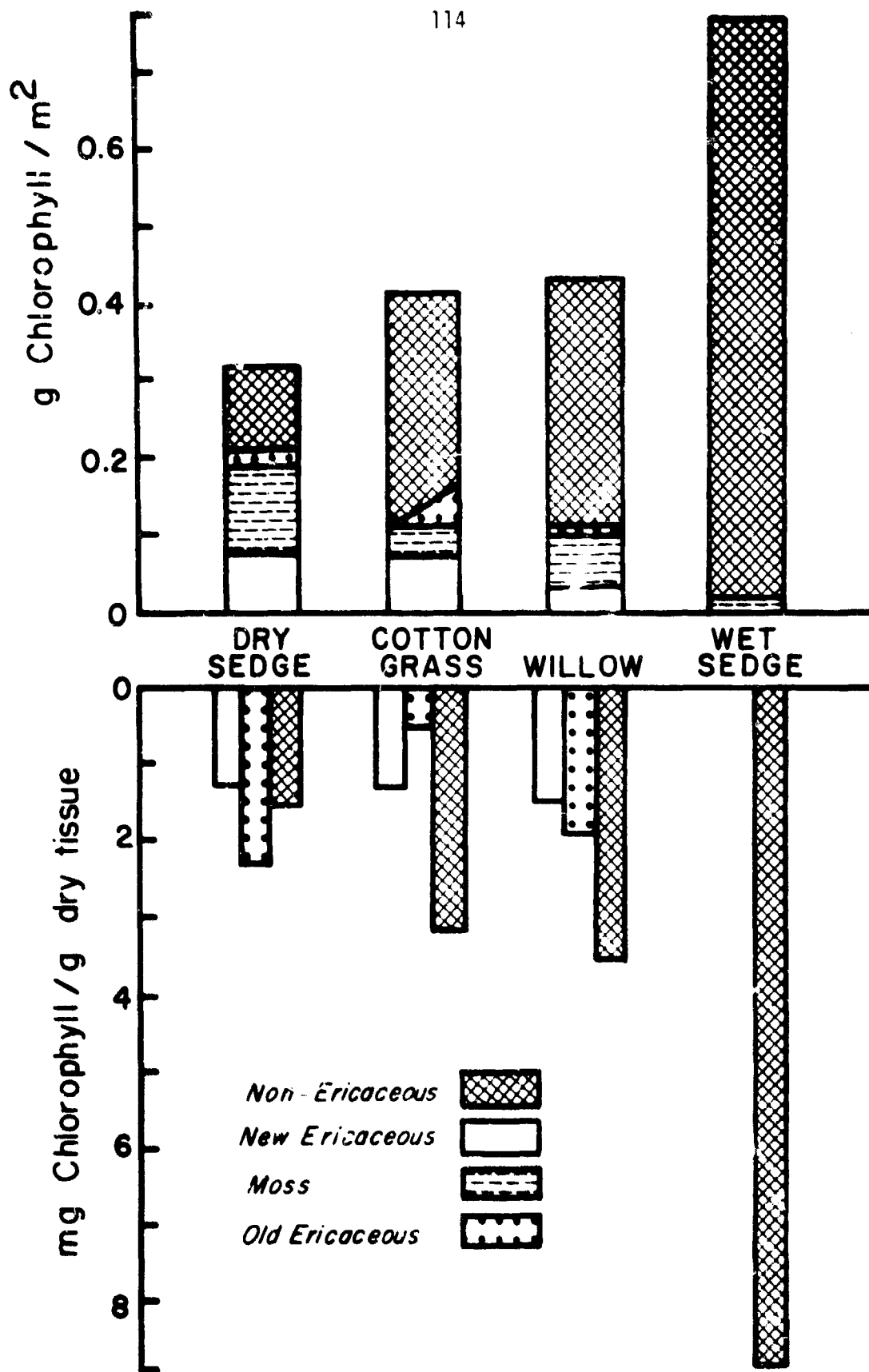


Figure 42. Histograms of Chlorophyll Distribution in Four Components of Four Plant Communities. Note that Bryophytes Accounted for 1/3 of the Pigment in Upland Dry Sedge Stands.

Table 29: Amount of Chlorophyll Per Unit Land Area ( $\text{g/m}^2$ ) and its Distribution in Four Arctic Tundra Communities.

Community	Old		Current Production		Total		Moss		Old		Moss		Total Standing Crop	
	Ericad	Ericad	Ericad	Non-Ericad	Ericad	Non-Ericad	Ericad	Non-Ericad	Chloro.	Chloro.	Chloro.	Non-Ericad	Chloro.	Non-Ericad
Dry Sedge	.081	.021	.021	.107	.128 $\pm$ 13%	.111	.25	.35					.320	
Cotton Grass	.078	-----	-----	-----	.303 $\pm$ 17%	.037	.19	9					.418	
Willow	.038	.014	.318	.332 $\pm$ 8%	.063	9	15						.433	
Wet Sedge	.000	.000	.756	.756 $\pm$ 12%	.015	0	2						.771	

Table 30: Amount of Chlorophyll Per Unit Dry Tissue (mg/g) in Four Arctic Tundra Communities

Community	Current		Production		Correlation, ratio, mg:g
	Ericadeous	Ericad	Non-Ericad	Ericad	
Dry Sedge	1.26	2.28	1.50		.97
Cotton Grass	1.30	---	3.15*		.99
Willow	1.50	1.86	3.53		.92
Wet Sedge	0.00	0.00	8.78		.90

\* Value represents total current production.

Table 31: Chlorophyll a:b Ratio and Carotenoid Ratio (OD 574: OD 652)  
in Four Arctic Tundra Communities

Community	Chlorophyll a:b				Carotenoid Ratio			
	Non Ericad	Current Ericad	Old Ericad	Moss	Non Ericad	Current Ericad	Old Ericad	Moss
Dry Sedge	2.43	1.94	1.83	1.67	1.69	2.08	2.43	2.38
Cotton Grass	1.77	----	1.90	1.52	1.68	----	2.28	2.88
Willow	2.59	1.99	1.96	1.89	1.70	1.94	2.26	2.45
Wet Sedge	2.01	----	----	0.99	1.59	----	----	1.79

Table 32: Current amount of chlorophyll and dry weight production in each sample of each community.

Community and Sample Number	mg Chl/10 dm <sup>2</sup>	g dry wt/10 dm <sup>2</sup>
<b>Carex dry tundra</b>		
1	8.16	4.27
2		3.28
3	13.76	6.84
4	7.22	4.70
5	11.91	5.81
6		3.87
7	15.62	6.84
8	21.35	10.30
9	15.67	8.56
10	8.70	4.79
	127.99/m <sup>2</sup> ± 16.93	59.26/m <sup>2</sup> ± 7.03
<b>Eriophorum vaginatum</b>		
1	22.41	6.60
2	39.58	11.95
3	39.93	12.83
4	34.94	11.44
5	14.43	5.01
	202.58/m <sup>2</sup> ± 50.72	191.32/m <sup>2</sup> ± 15.7
<b>Salix pulchra</b>		
1	32.02	9.09
2	28.85	7.05
3	20.72	7.78
4	36.74	10.05
5	51.77	13.86
6	36.86	9.87
7	30.11	7.82
8	26.49	8.47
9	27.23	8.72
10	40.47	10.55
	331.26/m <sup>2</sup> ± 27.7	93.26/m <sup>2</sup> ± 6.13
<b>Carex wet tundra</b>		
1	68.97	8.66
2	67.21	9.51
3	76.36	9.18
4	139.54	11.95
5	97.98	10.34
6	53.14	5.49
7	92.87	9.60
8	60.08	8.19
9	44.58	5.85
10	55.51	7.39
	756.14/m <sup>2</sup> ± 88.91	86.16/m <sup>2</sup> ± 6.26

TABLE 33: Weight Loss From Litter Bags Exposed at Barrow  
24 August 1965 to 12 September 1966

Sample	Oven Dry	Loss	%	Sample	Oven Dry	Loss	%
1	33.7	4.0	18.4	15	56.5	6.7	23.8
2	31.5	3.9	17.7	16	45.6	6.0	21.4
3	51.6	8.9	22.7	17	65.0	13.3	25.5
4	42.1	6.8	20.5	18	53.1	7.2	23.0
5	37.1	5.2	19.3	19	60.3	6.4	24.6
6	38.4	6.8	19.6	20	54.1	8.7	23.3
7	34.7	5.8	18.6	21	48.8	5.5	22.1
8	37.3	4.4	19.3	22	50.3	5.2	22.4
9	49.9	5.8	22.3	23	53.0	10.3	23.0
10	35.2	3.8	18.8	24			
11	48.4	7.9	22.0	25	-		
12	41.0	6.6	20.2	26	x =		21.3
13	41.5	4.6	20.4	27			
14	44.9	6.1	21.2	28			

Site	Plot	%Loss
1	2	19.7
2	17	20.1
3	21	23.1
4	31	23.7
5	46	20.2

## ACKNOWLEDGMENTS

This work was supported by both 1) the Department of Atmospheric Sciences, University of Washington under the Office of Naval Research Contract (NR 307-252, Contract NONR 477 (24)) and 2) U. S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire. The work in the field at North Meadow Lake and at Meade River was logistically supported by the Naval Arctic Research Laboratory, Barrow, Alaska. This summary of Arctic data is a contribution to the Tundra Biome Program of the International Biological Program.



## BIBLIOGRAPHY

1. Johnson, P. L. and F. B. Kistner. 1967. Breakup of ice, Meade River, Alaska. USA-CRREL Special Report 118, 1-12.
2. Johnson, P. L. 1969. Arctic plants, ecosystems and strategies. Arctic 22, 341-355.
3. Johnson, P. L. and J. J. Kelley, Jr. 1970. Dynamics of carbon dioxide and productivity in an Arctic biosphere. Ecology 51, 73-80.
4. Johnson, P. L. 1970. Ecological strategies or technological tragedy in the Arctic. A Report on Alaskan Ecology and Oil Development, Arctic Institute of North America, 1-13.
5. Kelley, J. J. Jr. 1966. An Analyses of Carbon Dioxide in the Arctic Atmosphere, Part 2. Scientific Report, Department of Atmospheric Sciences, University of Washington, 133 pp.
6. Kelley, J. J. Jr., D. F. Weaver and B. P. Smith. 1968. The variation of carbon dioxide under the snow in the Arctic. Ecology 49, 358-361.
7. Kelley, J. J. Jr. 1969. An Analysis of Carbon Dioxide in the Arctic Atmosphere Near Barrow, Alaska, 1961 to 1967. Scientific Report, Department of Atmospheric Sciences, University of Washington, Seattle, Washington, 172 pp.
8. Kelley, J. J. Jr. and D. F. Weaver. 1969. Physical processes of the surface of the Arctic tundra. Arctic 22:4, 425-437.
9. Tieszen, L. L. and P. L. Johnson. 1968. Pigment structure of some Arctic tundra communities. Ecology 49, 370-373.

Security Classification		DOCUMENT CONTROL DATA - R & D	
Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified.			
1. ORIGINATING ACTIVITY (Corporate author)		2a. REPORT SECURITY CLASSIFICATION	
UNIVERSITY OF WASHINGTON		Unclassified	
		2b. GROUP	
3. REPORT TITLE			
OBSERVATIONS OF CARBON DIOXIDE AND PLANT GROWTH IN AN ARCTIC ECOSYSTEM			
4. DESCRIPTIVE NOTES (Type of report and, inclusive dates)			
SCIENTIFIC REPORT			
5. AUTHOR(S) (First name, middle initial, last name)			
JOHN J. KELLEY AND PHILIP L. JOHNSON			
6. REPORT DATE		7a. TOTAL NO OF PAGES	7b. NO OF REFS
OCTOBER 1970		120	9
8a. CONTRACT OR GRANT NO.		9a. ORIGINATOR'S REPORT NUMBER(S)	
N00014-67-A-0103-0007		SCIENTIFIC REPORT # 8	
b. PROJECT NO.			
NR 307-252			
c.		9b. OTHER REPORT NO(S) (Any other numbers that may be associated with this report)	
d.			
10. DISTRIBUTION STATEMENT			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY	
		OFFICE OF NAVAL RESEARCH ARCTIC PROGRAM ARLINGTON, VA.	
13. ABSTRACT			
<p>This report presents the results of analyses of atmospheric carbon dioxide and ecological factors at Meade River Camp and at North Meadow Lake (Barrow), Alaska. The data summarize reference gas calibrations used in the CO<sub>2</sub> program, with a discussion of methods used to obtain the data for CO<sub>2</sub> concentrations in air at both stations. Variations of CO<sub>2</sub> in the air, at the ground level, and at 16 m above the ground are given for both the Meade River Station and North Meadow Lake. Meteorological observations are presented for the period of observations. The percent rate of growth of five species of tundra plants is shown, and the correlation between CO<sub>2</sub> concentration in the atmosphere and the percent of maximum ground is given. The data for the amounts of chlorophyll and dry weight production in each of four types of communities are presented. A list of publications resulting from the interpretation of these data is included.</p>			

KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Arctic Ecology						
Arctic Tundra						
Atmospheric Chemistry						
Carbon Dioxide						